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One of the three wave antennae at the Houlton Station. Each of the antennae is three miles long and is pointed accurately toward England

BELL TELEPHONE QUARTERLY

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The Telephone's Part in the Mississippi Flood Fight

"HELLO—this is John Parker talking. . . Have you any Fordson tractors? . . . Well, listen . . . I want you to get one of them up to the road leading up to the McCrea levee by daylight tomorrow morning—understand? . . . Send the bill to headquarters here."

A wiry, grey-haired man, keen of eye and square of jaw, sat tilted back in a chair in a room of the State House, Baton Rouge, La., a telephone receiver to his ear. He was in his shirt sleeves. On this particular day, and for many days before this, he had sat at this desk directing the defense forces in one of the grimmest and most dramatic contests ever fought in the long history of Mississippi floods. With Herbert Hoover, Secretary of Commerce, John M. Parker, former governor of Louisiana and now again pressed into service as Flood Director for the state, had kept in constant touch with every detail of the campaign throughout his state every moment of the day and night since the flood situation became acute on the lower river, weeks before.

And during all these anxious, nerve-straining hours

the telephone had never been out of reach. This particular telephone conversation was but a single incident in a series of events that are epoch-making—an incident that seems almost trivial and common-place. But it epitomizes the whole dramatic story of the telephone's part in this long-drawn-out struggle between human resourcefulness and endurance, on the one side and, on the other, the resistless power of the Mississippi at full flood.

It is strikingly like a game of chess, this contest with the rising tide of waters that sweeps down the valley, hurling its weight against levees and crumbling them into crevasses—a game in which success lies in anticipating every move, preparing to meet it as best one may, moving forces here and there to gain a slight advantage, and sacrificing now and then in order that the contest may end in a victory or, at the worst, in a stalemate. It is a game of chess in which whole parishes become the squares on the board and in which motor trucks, airplanes, surf boats and all the other machinery of flood fighting become the major pieces or pawns.

In such a contest, anticipating the enemy's moves is often desperately difficult. The flood waters have a way of working unseen—eating away a levee below the waterline, raising up the crown of the embankment in a "blister" at some unexpected point of attack, spouting out in a "sand-boil" at a spot which has become weakened while attention has been centered elsewhere.

Flood Director Parker rose from his chair, strode across the room to a map hanging on the wall and ran his hand in a sweeping gesture over the great "sugar bowl" lying in the lowlands to the west of the Mississippi, pausing here and there to point out the results that would follow if breaks were to occur at one or another point along the long line of earthworks that have been thrown up by generation after generation of people who have learned to respect—and to distrust—the "Father of Waters."

"I've lived along the river only sixty-four years," he said with a grim smile, "and I don't know what it's going to do—nobody does."

A Triumph for Coordinated Effort

It is precisely this element of uncertainty that makes absolutely imperative the coordination of all human forces for the fight against the rising flood waters—this, together with the widespread area affected and the fact that the contest is a long-drawn-out affair, straining nerves to the breaking point and wearing down endurance to such an extent that any lost motion must, in the end, spell defeat.

Cooperation and coordination are the keynotes of such a campaign as that which the people of the Mississippi Valley waged for months to save lives and property from the slowly rising waters. Cooperation and coordination are made possible, and made possible alone, by facilities for prompt, dependable, and *personal* communication. And, although other forms of communication played vitally important parts in mobilizing human forces to meet this worst of Mississippi floods, the instrumentality that was most valuable, because it alone could meet all of these requirements, was the telephone.

An Outpost Telephone

The telephone conversation referred to in the opening paragraph of the present article is a case in point. The McCrea levee was one of the strategic points along the line of defense that had been thrown up in the hope of saving miles upon miles of valuable Louisiana crop lands. Three days after this conversation was held, the levee broke and one of the gamest fights in flood history was lost as the waters from the crevasse began slowly to spread southward over Pointe Coupee Parish on their destructive way toward the Gulf of Mexico.

Just at this time, however, the fight to save the levee was at its height. Two thousand men, working in twelve-hour shifts of a thousand each, were desperately building a wall of sandbags behind the old levee, on the meager chance that if the latter gave way this secondary defense might hold. Reports to headquarters, calls for additional men, requisitions for more material, sped out from this outpost on the battle-line—by telephone. In a wooden box nailed to a tree, a few hundred feet from where the break was expected, there was a wall magneto set—the one direct and dependable link with the outside world.

The story of how that telephone got there deserves to become an outstanding chapter in the story of telephone service during times of emergency, yet it is hardly more noteworthy than scores of other stories of which it is typical.

Plant headquarters for the district in which McCrea is situated is at Baton Rouge, some sixty miles away by such roads as there are. Fifteen miles down the Atchafalaya River from McCrea is a little hamlet which, by a curious coincidence, for years has been known as Red Cross, the name having, however, no association with the great organization which has played so important a part in providing relief to the thousands of flood sufferers. At a village store at the point where two brick-colored dirt roads intersect—whence, it is said, the hamlet derived its name—there is a country store. In the store there is a telephone. The wire serving this telephone was the nearest point at which a line could be cut in to establish communication with the heroic little army up there on the levee, fighting their grim fight against the river.

Word came into the Baton Rouge headquarters on the night of May 19 that a telephone was wanted at McCrea. Shortly after daylight the next morning a construction gang, in charge of L. N. Gray, was at Red Cross, beginning the task of stringing fifteen miles of

wire through low-lying swamp lands, along a road which was hardly better than a trail and which a steady downpour was making constantly worse. Because of the necessity of getting a line working as soon as possible, it was decided to use a single-wire, grounded circuit. On stumps, on fence posts, on trees and now and then on a temporary pole hastily set in the soft ooze of the swamp, the line was strung, foot after foot, mile after mile. Meanwhile, it began to look as if the workers on the levee were to lose their fight—a break was expected at any moment. The telephone men were aware of this fact, and of the hazard it involved, but worked on. By half-past five o'clock that afternoon they had the fifteen miles of line strung and the telephone ready for service.

Stringing fifteen miles of wire a day, even under the most favorable conditions, is by no means a bad day's work. Doing it under these conditions, and in the face of imminent danger is—well, it is typical of the seemingly impossible things that have been done by telephone men, all up and down the length of the flooded portion of the Mississippi Valley during the spring and early summer of this year. There is no name for this sort of thing, except to call it the Spirit of Service translated into terms of action, and then more action, and then still more action.

Two Telephone Heroines

So much for a typical illustration of the telephone man as an actor in this drama that has been staged along the levees from Cairo, Ill., to the Gulf. What about the telephone woman—the girl at the switchboard? There are scores upon scores of little central offices scattered all over the flooded area to which one might turn for an answer. One of these is just across the Atchafalaya from Red Cross, in Melville, a village of perhaps fifteen hundred people. South and southwest of Melville stretches a wide area of farmlands, dotted with villages, the white population of which consists largely of "Cajuns" or

"Cadgens"—the descendants of the exiles from historic Acadia following the French and Indian War.

Melville and a long stretch of this Evangeline Country were threatened by waters from a series of breaks at the head of the Bayou des Glaises Basin covering seven parishes with an area of 2,098 square miles and a population of well over a hundred thousand people. The Melville operators had been busy for several days sending out warnings, expediting the movement of refugees into concentration camps at Baton Rouge and elsewhere—"standing by" in all of the hundred and one ways demanded of telephone employees at such a time.

Such was the situation on the afternoon of May 17. The water in the Atchafalaya was high, and running like a mill race. The village itself was surrounded by a protection levee and seemed as secure as it could be made under existing conditions. Suddenly, with hardly a moment's notice, a section of the levee gave way, the water pouring through the crevasse and quickly flooding the town.

Mrs. Lollie Glaizer, agent and chief operator, and Miss Christine Clark were on duty when the crevasse occurred. Notified of the break, they at once began calling subscribers and giving them warning. The flood waters rose rapidly, access to the building being possible only by means of chopping out a portion of the siding of the switchboard room. In anticipation of the flood, the switchboard had been raised on a scaffold or platform. In this building, thus isolated by water which now filled the streets to a depth of from eight to fifteen feet, the two operators worked on, handling a mass of toll calls to nearby points, until two o'clock in the morning of the eighteenth, when maintaining service from the switchboard became no longer possible. A few telephones were then installed in an upper room of the Abel Hotel, and from this impromptu central office the operators continued to handle toll traffic.

Meanwhile, a span of the Texas and Pacific Railway

Company's bridge connecting Melville with Red Cross, had given way, crashing into the river, and carrying with it the telephone lines running into Melville from the east. The lines to the west were partially submerged by flood waters, which spread over the lowland in a vast lake from twenty-five to thirty miles in width. During this period the operators' only food and water supply was brought to them in boats. Although no human lives were lost in Melville, animals by thousands were drowned throughout the entire Bayou des Glaises Basin and sanitary conditions in Melville were becoming most serious. Telephone lines into the town having been rendered useless and need for further service having ceased, the operators were withdrawn from the town on the afternoon of May 20—against their emphatic protest that they were willing to remain if their services were required.

The Nation's Most Widespread Disaster

Such are two illustrations of the service of telephone men and women in the emergency presented by what Secretary Hoover describes as the greatest of American disasters. These illustrations are separated, in point of time, by only a few days, and in point of geographical location, by only a few miles. Multiply the picture they present by the period from late March to about the middle of June, and then multiply this result by the sweep of territory from the upper reaches of the Mississippi and of its larger tributaries to the Gulf, and the result will provide something like a composite picture of the telephone's part in this, the grimmest and most dramatic of battles against the sullen waters of the great river—and, from the standpoint of the saving of human lives, the most victorious.

The first floodcrests reported on the main river were at Cairo, at the mouth of the Ohio, one of March 25, the second on April 8 and the third and greatest on April 20, with a stage of 53.2, which is 1.6 feet above

the previous highest record at Cairo. With the record-breaking high water pouring down from the river's sources, there was exceptionally heavy rainfall throughout the basin of the lower Mississippi and its western tributaries during the two weeks ending April 20 and 27 respectively.

As a matter of fact, there had been abnormally heavy rainfall throughout the entire Mississippi basin since the latter part of the autumn of 1926. This basin, which stretches northeast to include a portion of New York state and northwest well into Montana, covers an area of 1,240,000 square miles, or about forty-one per cent of the total area of the United States.

Swollen by the waters pouring down into its main channel from this vast drainage area, the Mississippi proper began to show floodcrests which broke all previous records. At Helena, Ark., the gage stood at 56.7 on April 26—1.5 feet above previous high water marks. By May 4, the stage at Vicksburg, Miss., was 58.7, or 3.7 feet above the previous record. On May 1 and 4 the river level at Natchez, Miss., was 1.2 feet above previous high stages. Baton Rouge showed a similar increased level and it is probable that but for the creation of an artificial crevasse below New Orleans, the latter city would have had high water which would have swept over its splendid system of river-front and protection levees.

Meanwhile floodcrests were being reported along the tributaries feeding the Mississippi from the west, notably the White River, the Arkansas and the Ouachita. At Fort Smith, Ark., the Arkansas reached a stage of thirty-eight feet, the highest in the history of the town, a cyclone and almost continuous rainfall adding to the flood damage.

On April 20, the Mississippi levee at New Madrid, Mo., gave way, flooding the entire city and a wide stretch of surrounding country to a depth of from five to fifteen feet. The next day the great levee on the east side of the Mississippi eighteen miles north of Greenville, Miss.,

broke, the crevasse waters covering mile after mile of the fertile lowlands lying within the Yazoo delta. So the floodcrests proceeded down the valley, gnawing away at levees and creating crevasses at Milken Bend, Winter Quarter, Glasscock, Babstom, and Bougere, all on the west bank of the Mississippi, in Louisiana, the slowly rising waters inundating the Tensas Basin, with an area of approximately 4,600 square miles and a population, according to the 1920 Federal Census, of 94,000.

By May 15, official reports showed that the Bayou des Glaises levee, approximately fifty miles long protecting a front of twenty-five miles west of the Atchafalaya, was dotted with something like ten crevasses, two of them of immense proportions and all widening rapidly as the rushing waters washed away the ends of the stretches of levee still remaining. Flood waters from this series of breaks moved down the basin lying to the west of the Atchafalaya, spreading out over a greater portion of the Acadian country and covering thousands upon thousands of acres of sugar crops.

Only the levee at McCrea, to which reference has already been made, stood between the advancing waters and fertile Pointe Coupee Parish, lying between the Mississippi and the Atchafalaya, and, after one of the most stubborn fights in flood history, this wall of earth gave way on the morning of May 24, and another wide expanse of lowlands became a prey to the oncoming flood.

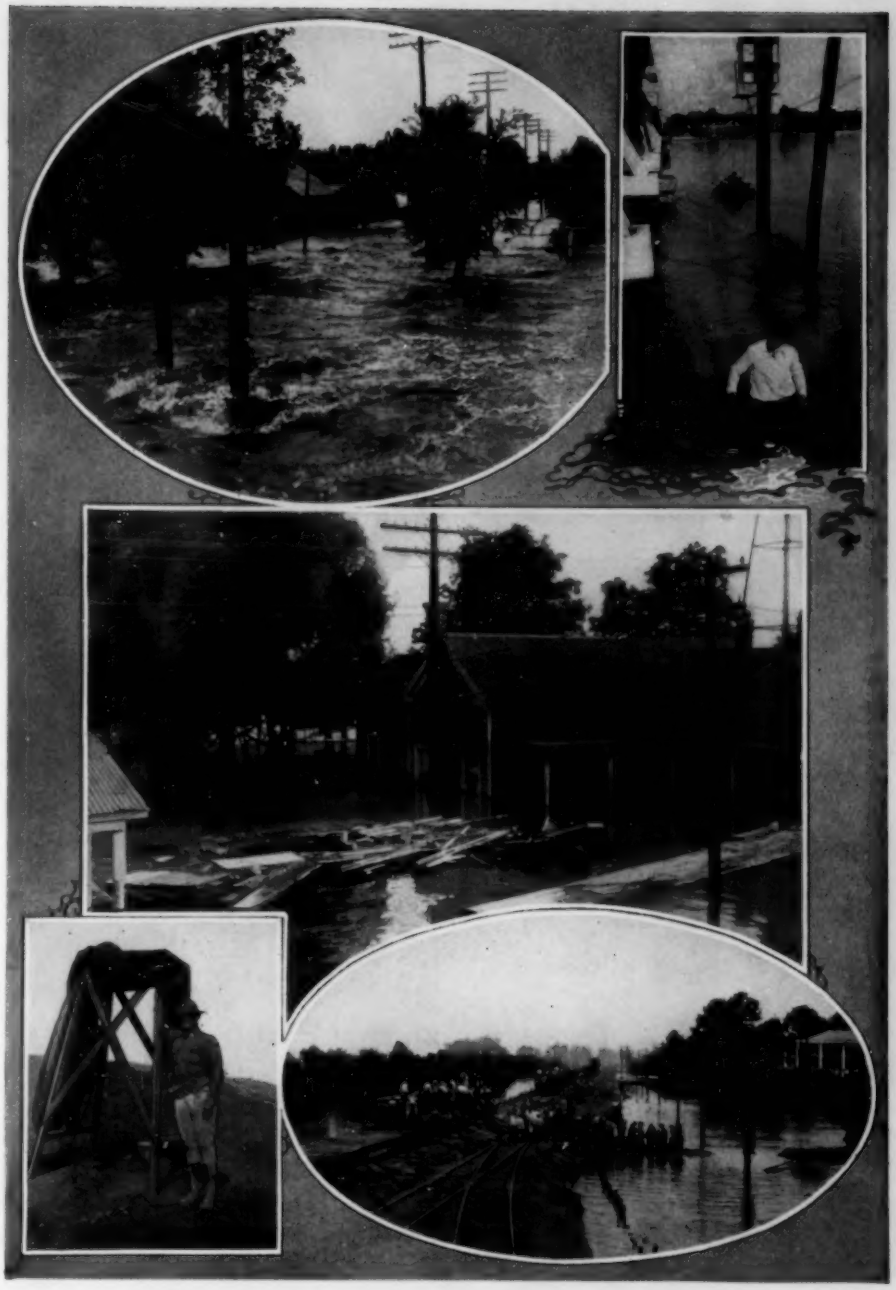
A Man-Made Crevasse

In the meantime, Baton Rouge and New Orleans had been recording rising water, and so threatening had the situation along the lower river become that, during the last week in April, engineers decided that, by way of protecting life and property in New Orleans, an artificial crevasse should be created near Poydras, on the east bank of the river, some twelve miles below the city.

By agreement with the officials of the territory to be

flooded, which provided for indemnification for loss of crops and other damages, and in accordance with a proclamation of the governor, the evacuation of all of St. Bernard Parish now began. Men, women and children, livestock and household goods were transported to safety, many of the inhabitants being cared for in refugee camps in New Orleans. For three days this exodus continued, the country being combed by airplane and motor in order to be sure that every inhabitant had been moved from the lowlands which were shortly to be transformed into a vast lake. On April 29 and on several succeeding days charges of explosive were shot at Caernavon, a mile south of Poydras, and through the artificial crevasse thus created, which rapidly widened to about 2,000 feet, a portion of the Mississippi's flood waters were diverted from their regular channel and, spreading out across the marshes, made their way directly to the Gulf of Mexico. Another crevasse had been created, still farther down the west bank of the river at Junior Plantation, when a large steamer accidentally rammed the levee, causing a break through which water poured in considerable volume, flooding portions of Jefferson and Uemines Parishes. These two crevasses lowered the crest of the flood sufficiently to avert danger from the city of New Orleans, which at no time reached a river stage as high as its previous high record.

Such, in brief, is the history of the greatest of Mississippi floods. A more complete account of the disaster would involve the detailed mention of other crevasses, both on the main river and on some of its tributaries; the day-by-day description of a battle fought along more than a thousand miles of river; the moving of some 600,000 people from threatened localities to places of safety in refugee camps or elsewhere; the care of this army of exiles by the American Red Cross and local flood committees; the far-sighted provisions against outbreaks of contagious diseases; the mobilizing of federal, state and local organizations, both military and civil, in order



(1) Street in Melville, La., showing portion of New Orleans-Dallas toll line. (2) Maintaining service under difficulties at Bayou Boeuf, La. (3) Telephone office at Melville on the afternoon of the break in the levee. Through the side of the building, chopped away to afford access to operating room, Miss Christine Clark may be seen on duty at switchboard. (4) An emergency telephone on levee south of New Orleans. (5) Repairing a railroad right-of-way. Memphis-Vicksburg-New Orleans toll line at right of embankment.

(6) Preparing a toll line near Lake City, Ark., for the predicted six-foot rise on the St. Francis River. (7) Twenty-five feet of water along the Little Rock-Memphis line, showing toll cable terminals almost submerged. (8) Little Rock, Ark., telephone linemen in boat clearing debris from Little Rock-Texarkana toll line. (9) The White River about one mile south of Newport, Ark. (10) In Morgan City, La. and many other towns in the flood area telephone operators were carried to and from their work in boats.

that this tremendous task might be undertaken efficiently and carried out successfully.

The history of the Mississippi Flood of 1927, as such, must be written elsewhere. Enough has perhaps been told to indicate something of the problems involved in meeting the critical situations presented in town after town, state after state, as the floodcrests made their way slowly but irresistibly down the valley.

The Importance of Communications

Enough has been told, too, to indicate how important a part all forms of communication played in mobilizing the human and mechanical factors involved in the fight against the flood, in coordinating all forces so thoroughly that what might have been a losing fight all the way from Cairo to the Gulf was transformed into a splendid victory.

Of the communication aspects of the flood campaign Secretary Hoover has said:

> "By establishment of a net of communications by telegraph, telephone and radio with all segments of our organization and over all parts of the danger area, we have been able instantly a great break came in the levees to throw out advance warning to the people below. We have been able to coordinate the systems of motor trucks and automobiles and railway cars to transport many of the people, their animals and their belongings to places of safety in advance of the water.
>
> "We have been able to provide fleets of river steamers and barges with thousands of motor boats to comb the flooded territory for those on housetops or high spots and to transport them to safety. We have had an airplane service inspecting the flooded territory twice daily to report any evidence of life or distress. With our communication system we have been able instantly to transmit news of these cases of distress and to secure the prompt dispatch of boats in relief."

Without minimizing the importance of other forms of communication, it may be well to point out that the telephone played a unique part in this coordination of relief forces, partly because it is the only form of personal communication, available to all without the intervention of a trained operator to transmit or receive messages, and partly because of the widespread nature of its service. There has been hardly a hamlet throughout the entire flooded area with which it has not been possible to maintain direct, two-way, personal communication over the network of telephone wires that crosses and recrosses this vast territory comprising the Mississippi Basin.

Forecasting Floodcrests

As has been indicated, the successful outcome of this grim game of chess against the Mississippi, with thousands of lives as the stake for which the contest was played, was at all times dependent upon anticipating, as nearly as possible, the conditions which it would be necessary to meet. The greater part of the responsibility of forecasting the movements of floodcrests throughout the lower part of the valley rested upon Dr. I. M. Cline, meteorologist in charge of the U. S. Weather Bureau, New Orleans. Dr. Cline has seen more than a quarter of a century of service at New Orleans, and knows the river as few others know it. Of his contribution to the flood campaign, Mr. Hoover has said:

> "Dr. Cline is a wonder. His flood forecasts have been absolutely uncanny in their accuracy. He has without doubt saved the lives of thousands of people with these bulletins.
>
> "The engineers have been aided. His reports have been so accurate that they could watch from day to day the increasing danger at points along the river. The relief workers have been aided immeasurably. They have been told exactly where to concentrate boats and trucks, what areas were most necessary to

evacuate and, almost, just how much water was going to rush through each crevasse as it opened."

Behind this story of the saving of lives through the Weather Bureau bulletins is another—a telephone story—which Dr. Cline himself delights to tell. Practically every bulletin he has issued during the period of the flood has been based to a very considerable degree upon information gathered at points up the river and transmitted to the state headquarters of the Southern Bell Telephone and Telegraph Company, at New Orleans, and thence communicated to the Weather Bureau officials.

"If the telephone system had never done anything else in all of its fifty years," says Dr. Cline, "it would have earned all the credit it could possibly receive for the assistance it has rendered in this single phase of flood work during the present year."

The Tremendous Task of "Carrying On."

Apart from the extra burden which the emergency imposed upon the men and women of telephone service, simply maintaining the lines and keeping the switchboards in operation under flood conditions was a task calling for extraordinary resourcefulness, fidelity to duty and, in scores of cases, heroism of the highest order.

Such cases of devotion to duty in the maintaining of telephone service as it is possible to cite here may be accepted as hardly more outstanding than dozens of others which could as well be selected. Loyalty to the public interest was at all times the rule, not the exception. The first thought of the telephone men and women, throughout the entire flood area, was not of themselves, their families or their property, but of their duty in getting the messages through—messages which more often than not were matters of life or death.

The backwater draining south from the New Madrid break, for example, flooded the lowlands to the south of the crevasse to such a depth as to endanger the tele-

phone circuits leading from St. Louis to Memphis. In order to maintain service, extension fixtures were placed at the tops of the poles and the through circuits raised clear of the water. To accomplish this, linemen worked nude and dived from a railroad embankment, swimming some forty feet to each pole in order to reach the submerged crossarms and untie the lines.

A case of individual devotion to duty that deserves particular mention is that of J. F. Duckworth, of Fort Smith, Ark. Damage caused by flood waters was intensified by a cyclone and toll service was interrupted for a period of twenty-four hours. At the beginning of the flood, Mr. Duckworth was at the hospital in Fort Smith, staying with his wife, who was not expected to live. In spite of his personal concern, he left the hospital when he saw the cyclone in progress, and volunteered for duty, working day and night until the emergency had passed.

Throughout the whole flooded area linemen worked in motorboats, rowboats and canoes, repairing lines broken by floating debris or raising the wires to extension fixtures placed above the high water level. Eyewitnesses report miles of pole lines in the Yazoo delta over which service had been restored by spiking two-by-four timbers to the tops of the poles and mounting fixtures for the necessary wires upon these improvised extensions.

Tragedy Mixed With Comedy

While engaged in this work of restoring or maintaining circuits, the telephone plant men were able to perform many services outside the line of their duty, some of them reflecting the drama that was enacted along the long flood battleline. Not infrequently this drama, though having its tragic side, was touched with comedy.

A group of plant men who had been working in the flooded area outside of Vicksburg, for example, found an old colored man, who, with his faithful dog, had been

marooned up a tree for some thirty-six hours. Pulling their rowboat over to the foot of the tree, they offered to take him to a point of safety.

The aged negro hesitated, anxiously asking whether the dog would be taken along. The telephone men told him that they were afraid there would be no room in their small boat for the animal.

"Well, Colonel," the old darkey replied, "Me an' dis houn' dawg has been hangin' 'roun' together for mos' ten years, and if you-all can't take us bofe, ah reckon we-all jes' have to stay up dis here tree and drown together."

They took the dog.

In central office after central office it was necessary to remove power equipment from the basement to upper floors, and often to install supplementary apparatus because of the failure of local electric lighting and power plants. At Newport, Ark., a threatened inundation of the entire town necessitated sending to Little Rock for a charging machine. The normal railroad distance from Little Rock to Newport is about eighty miles but, due to disruption of rail communication, the train was compelled to travel some 400 miles before the generator could be delivered. It has been by meeting a multitude of such difficulties as this that telephone plant men have been able to maintain service and thus to help Secretary Hoover and his vast flood relief organization, as he himself forcefully expresses it, "to do the job."

The Spirit of Service at the Switchboard

Meanwhile telephone women throughout the flood area had written their names high on the roll of heroines of the public service. Some of the stories of their devotion to duty have already been told in press dispatches coming out of the flood country. Some will never be told—stories of operators in small and isolated central offices whose fidelity has not happened to have attracted

the attention of newspaper correspondents, but who have, nevertheless, played the role of heroines.

It is manifestly impossible to recount in detail all of these deeds of devotion, of courage, of resourcefulness, of self-effacement. For the purpose of this article, it must suffice to cite an illustration or two.

The morning after the New Madrid break, when a government steamer rescued 900 refugees from the city, four telephone operators, Mrs. Emma Powell, agent, Mrs. Frances Myles, Mrs. Minnie Gaines and Miss Kathryn Baehr refused to forsake their posts. The District Traffic Chief called Mrs. Powell, advising her that the company did not expect her to stay if she was in danger. She received several calls from friends warning her to leave the office at once, but she and her operators decided to remain on duty, regardless of the hazardous conditions. The levee that broke was about three blocks from the telephone office. Mrs. Powell later said that she and her fellow operators were so busy at the switchboard that it was three hours after the levee had broken that they learned about it. The telephone exchange was the only business in operation in New Madrid, and the only people remaining in the town besides the operators were men working on the levee.

Three days before high water reached the little town of Rolling Fork, Miss., Miss Belle Colum, one of the two operators at the agency exchange in the village, had returned from a hospital at Greenville, after undergoing an operation. When the flood waters began to creep through the streets, she volunteered to return to the switchboard and with Mrs. Ira Cortright, the agent, remained on duty continuously for several weeks, the two women making their home in the operating room, which was on the second floor of the telephone building. During this time the building was completely surrounded by high water and their only supplies of food and drinking water were brought to them by rowboat.

In many of the towns of lower Louisiana, hard hit by

the flood, preparations for its arrival were made in advance by raising the switchboards on platforms or scaffolds, service being continued without interruption. Among the towns in which these measures were necessary were Newellton, St. Joseph and—by an ironical coincidence—Waterproof. In all of these towns, practically everyone except the operators left for places of safety on higher ground.

Providing Service—Plus

So the story runs, from the highest point in the long flood battleline to the Gulf of Mexico—a story of men and women who have met extraordinary conditions in an extraordinary way; who have not merely maintained service, but have gone far beyond normal service requirements in order to meet the unusual demands of a crisis involving the lives and property of hundreds of thousands of people. Their task has not been merely that of maintaining service, but in providing service *plus*.

Indeed, some of the most remarkable exploits of the flood, from a telephone standpoint, have been those arising out of extra demands upon telephone men and women—of plant men who have established records in making quick installations at Red Cross or Flood Relief headquarters, or at some isolated point where service was needed without delay; of operators who have cheerfully and efficiently handled traffic at three times normal volume; of an organization so thoroughly coordinated and ready for service that not even the unexpected found it unprepared.

"Do you think you can have a telephone extension run into Mr. Hoover's private car as soon as he arrives in town this morning?" a Baton Rouge plant man was asked, one day when flood conditions were at their worst and everybody was busy.

"I don't *think* I can," was his reply, "I *know* I can!" Mr. Hoover was talking over that telephone within a few minutes after his train came to a standstill.

"I *know* I can!" has been the watchword of the men and women who have made possible the telephone's part in the winning of the Mississippi flood fight of 1927—a part that has been by no means an unimportant one. Which brings us back to the little office in the State House at Baton Rouge, with Flood Director Parker tilted back in his chair. For, in his simple and direct way he has provided just about the best summary of how vital a function the telephone has performed, from first to last.

"In our part of the territory," he said, "we have moved thousands upon thousands of men, women and children out of the path of the flood and, so far as we now know, we haven't lost a single human life. It never could have been done . . . it just simply could *not* have been done without the telephone!"

What has been true of Louisiana has been equally true of the whole disaster-swept Mississippi Valley. Secretary Hoover has stated that, from the moment the flood relief organization began to function to the completion of its evacuation work in lower Louisiana, 400,000 people have been moved from their threatened homes to places of safety—*with the loss of but a half a dozen lives.* Here is a record that will stand as a monument to courage, to resourcefulness, to efficiency born of cooperation; a record of victory wrested from defeat; a record of a tremendously difficult task well done.

In the doing of this task the American people may justly take pride. In it the men and women of the Bell System may take especial pride. It couldn't have been done without the telephone.

R. T. BARRETT.

EDITOR'S NOTE:—Mr. Barrett is of the staff of the Information Department of the American Telephone and Telegraph Company, and visited Louisiana in May in order to obtain the facts upon which this article is based.

The Receiving Problem in Transatlantic Radio Telephony

IN THE transatlantic radio telephone experiment in January, 1923, when Mr. Thayer spoke to a group of listeners in London, a powerful and efficient 200-kilowatt transmitting plant worth nearly a million dollars was used. The receiver sent to England was not much more elaborate than the high grade broadcast receiving set of today. The transmitter made a near approach to the economic limit. The cost of the receiver was insignificant in comparison. No profound consideration was necessary to make it clear that the needed improvement in system performance could most economically be sought at the receiving end. The result of four years' work guided by this philosophy is the Houlton, Maine, transatlantic radio receiving station.

Before considering the work of these last four years it is interesting to go back a number of years farther and review briefly the evolution which accounts for the situation in 1923.

Until the audion or vacuum tube appeared the distance to which radio signals could be sent was limited by the difficulty of getting the signals loud enough to be easily audible in a telephone receiver. There being no ability to amplify, it was necessary in long distance point-to-point communication to build large and expensive receiving antennae to collect as much signal energy as possible. The search for more sensitive detectors to convert this energy efficiently into telephonic currents was one of the principal activities of radio investigators. The vacuum tube changed all this by so increasing the sensitivity of receiving that even the weakest signals could be amplified to any desired loudness.

Then the limitation became the natural atmospheric disturbances called static which produced noises overpowering and blotting out the weaker signals which

could otherwise have been received. The most apparent way to strengthen signals relative to static was to increase the power of the transmitter and radio telegraph transmitters of several hundred kilowatts came into use.

Influence of the Vacuum Tube

Thus the first influence of the vacuum tube aside from increasing the possible signaling distance, was completely to upset the economic balance between transmitting and receiving for long distance point-to-point systems. Large and expensive antennae for receiving became unnecessary because the signal energy from a small antenna could be amplified. The receiving plant became cheaper. On the other hand the transmitting plant grew in expense until the mere cost of the transmitting station began to become prohibitive.

For many years it had been a dream of inventors to create a device which, attached to a radio receiving antenna, would "eliminate" static. It would have taken an optimistic dreamer to conceive of cutting down the power of static 5,000 times, but this is relatively just what the Houlton plant does as compared to the earlier receiving apparatus at Riverhead, Long Island.

This improvement came about through the application of two simple but important principles. The first of these is directional receiving. The available agency best adapted to accomplish this was found to be the wave antenna, a form of antenna developed by the engineers of the Radio Corporation of America, which has the property of receiving efficiently from a narrow geographical angle directed toward the transmitting station and of receiving very little or not at all from other directions. This results in a substantial reduction of static coming in from all except one general direction. The development of refined methods of adapting the wave antenna to radio telephony and of systems for combining several antennae have made it relatively as effective as 100 times increase in transmitting power.

The Problem of Location

The second principle is the choosing of the best location for the receiving station. Careful measurements disclosed that in Maine not only was the severity of static less than near New York but most of it came from the southwest, whereas signals from England come from northeast. This provides the most favorable conditions for realizing the advantages of directive receiving. The improvement in static conditions was equivalent to increasing the transmitter power 50 times.

These two improvements, representing, respectively, the equivalent of 100 times and 50 times power increase, multiplied together account for the 5,000 times improvement which is ascribed to the Houlton station. Since the transmitter in England has a power of about 200 kilowatts, it may be said that this unobtrusive little receiving plant in Maine is as fruitful in results as a gigantic transmitting station of 5,000 times 200, or 1,000,000 kilowatts power. It is a veritable radio David more potent than any Goliath of transmitting power which it would be feasible to construct.

But let it not be thought that such returns flow from the mere recognition of two simple principles. Endless attention to detail and the bringing to bear of special knowledge and methods from all branches of the telephone art were necessary. Even such a stranger to radio as permalloy is to be found at Houlton doing its essential bit at a crucial point in the circuits. Ingenuity and invention have played their parts but, as in all telephone work, scientific quantitative testing and painstaking engineering design have been the backbone of success.

The British Post Office engineers have also applied these principles. The effectiveness of every kilowatt radiated from our Rocky Point station is being multiplied hundreds of times by their new receiving station at Cupar in the north of Scotland where the most modern developments in wave antenna systems are being put

into service to block out the static coming up from southern Europe and tropical Africa.

These advances in the radio telephone receiving art are mainly what has made the difference between giving a demonstration under favorable conditions in 1923, and carrying on a daily commercial service in 1927.

That economic equilibrium between transmitting and receiving has not yet been reached is indicated by the fact that the cost of getting the last two-to-one improvement at Houlton was materially less than would have been the cost of doubling the power of the British transmitter. Such an economic equilibrium is, of course, not necessarily of itself an end to be attained. Until a satisfactory degree of system performance has been achieved, a lack of economic equilibrium is merely an indicator which, used with technical foresight, points the line along which the most profit from development work is likely to be found.

Further improvement in long wave transatlantic receiving will be increasingly difficult to get. Possibly it will never be feasible to obtain sufficient further improvement of the present type of system to insure that the circuit will operate reliably through the heavy barrages of static which nature lays down on many summer days. But the advances now in actual use have already permitted a degree of reliability far greater than could have been realized only a few years ago.

RALPH BOWN.

Commercial Uses of Telephotographs

IT is now two years since the commercial transmission of pictures by wire was undertaken by the American Telephone and Telegraph Company through its Long Lines Department. While undertaken on a commercial basis, this method of transmitting pictures was at the time, and still is, in the experimental stage, and improvements continually are being made in the quality of the transmissions.

The initial installation consisted of equipment for the transmission and reception of pictures at three cities, New York, Chicago, and by cooperation with The Pacific Telephone and Telegraph Company, San Francisco. During the past six months five other cities have been added, namely, Boston, Atlanta, Cleveland, St. Louis and Los Angeles, so that for the present service is being rendered directly to a total of eight of the principal cities of the United States and, with the assistance of the air mail and railway mail services, indirectly to many other large cities. It is assumed for practical purposes that all places of importance within 150 miles of any of the eight terminal cities are in a position to send or receive Telephotographs to or from any of the terminal cities within a matter of eight hours on a railway mail service basis. Points on air mail routes much farther than 150 miles can be served in the same time.

Use of Telephotographs in Newspapers

At the start it was believed that the principal uses of Telephotographs would be as spot news pictures in newspapers and for picture agencies. Actual experience has shown that other commerical uses of Telephotographs are of greater importance numerically than newspaper uses. This fact does not detract, however, from the importance of spot news pictures in newspaper work, and the use of these transmitted pictures in newspapers is increasing.

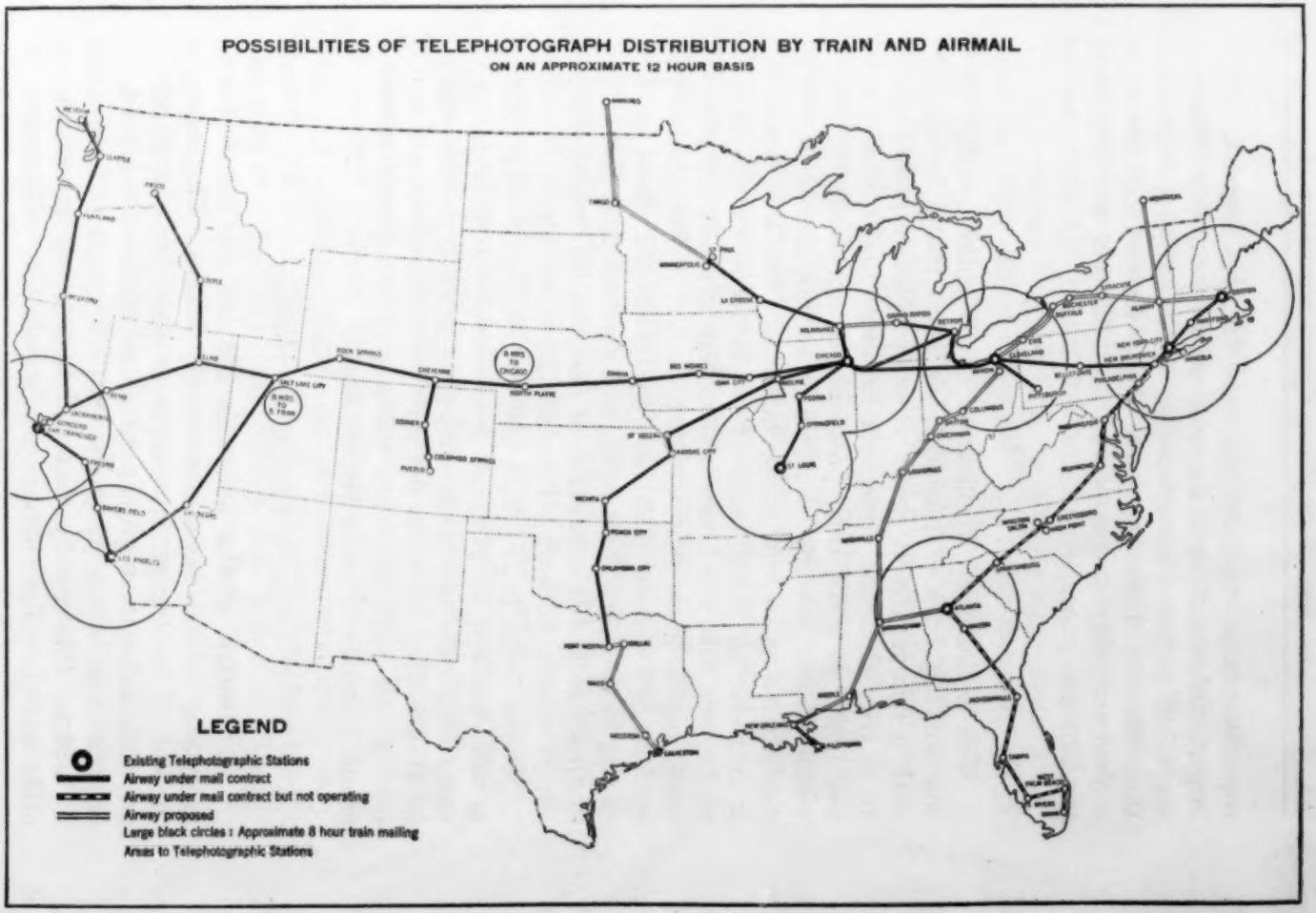
The transmission of news pictures is largely confined to disasters, sporting events, personalities in the public eye generally or for the moment, and other matters of considerable importance from a nationwide standpoint. Thus, news pictures may be in great demand at one moment, and then there will be periods when few, if any, press transmissions are handled.

Telephotographs, as well as other pictures reproduced in newspapers, do not always do justice to the originals from which they were made, and unfortunately many individuals have formed the wrong impression as to the quality of Telephotographs by the pictures which they have seen in the newspapers. Of course, pictures of calamities often are taken under very adverse conditions so that the originals themselves are of inferior quality. This fact, together with the use of a coarse screen in preparing half-tones, the high speed of the printing presses, and the inferior grade of paper used as news print, all tend to cause poor reproductions.

Actual prints from a Telephotograph negative frequently are so nearly like the original that the two cannot at first glance be distinguished. Some expert photographers have refused to believe that a certain picture was an actual transmission until it was examined with the aid of a magnifying glass capable of showing the structure.

It has been found in practice that there are few pictures of sufficient interest to attract nationwide attention. There are approximately 2,400 daily newspapers in the United States and while many of them use pictures extensively an analysis of the pictures employed will show that the majority have a local rather than a national appeal. This fact, of course, limits the use of Telephotographs by newspapers. The cost of transmission, does not seem to be a deterrent to the use of Telephotographs by newspapers when the picture is of real national importance.

Incidentally a news picture of rather a novel type was


POSSIBILITIES OF TELEPHOTOGRAPH DISTRIBUTION BY TRAIN AND AIRMAIL
ON AN APPROXIMATE 12 HOUR BASIS
8 HRS. TO CHICAGO
8 HRS. TO S. FRAN.
LEGEND
Existing Telephotographic Stations
Airway under mail contract
Airway under mail contract but not operating
Airway proposed
Large black circles : Approximate 8 hour train mailing
Areas to Telephotographic Stations

recently transmitted at the opening of Congress. A large Chicago daily sent a prominent cartoonist to Washington to picture his impressions of the opening days of the session. These cartoons were successfully transmitted each day and appeared the following morning in the Chicago paper.

General Uses

The commercial application of Telephotographs to the varying lines of business has been found to meet with a comparatively small amount of sales resistance. It is true that the American business man usually is too busy with his own problems to speculate on the virtue of new accomplishments in science and their immediate value to him in his business. For this reason, in introducing Telephotographs it is necessary not only to contact with the business man but to study his problems, his methods and the distribution of his products so that a concrete plan may be presented showing a saving in time, labor, or both, and guaranteeing absolute accuracy in the transmission of documents, graphs, etc., which cannot be sent otherwise except by mail.

It has been found that the use of Telephotographs is not confined to pictorial reproduction but in many cases long messages, typewriting or printed matter can be transmitted by wire, not only with dispatch and accuracy but with economy when compared with other existing means of rapid transmission.

Uses in Financial Houses

Illustrative of the above is the use of Telephotographs by various bond and security houses. The transmission of photographs to serve as copy for newspaper advertisements has proven to these clients the speed, accuracy, and economy of the telephotograph service.

Out of this use by financial houses has grown another use for Telephotographs which has advantages.

Before a bond or stock issue is placed upon the market and advertised it is customary to form a syndicate of the houses which are to market the issue. The matter is presented in considerable detail to those invited to participate in the syndicate and telegraph messages of as many as 1,000 to 1,500 words often are required. These messages may be sent to 100 or more firms located in the principal cities throughout the country. It is apparent that even at the most favorable prevailing rates the charges for such service will be very high. With Telephotographs the required number of prints can be made at each Telephotograph office and mailed to the addresses in its vicinity. By employing air mail to deliver to distant points not directly reached by Telephotograph prompt service can be rendered.

The ordinary sheet 8½″ x 11″, letterhead size, may contain a typewritten message of 750 words so that a 1,500 word message may be sent in two pictures. Additional prints can be furnished at a nominal cost and from these facts it is evident that such messages can be delivered with economy and speed to a large number of addresses in various cities and, what is more important, all copies will be identical and free from error.

In a recent transaction of this kind a message was delivered to 77 bond houses on the Pacific Coast within a few hours. On the same day acceptance of the proposition had been received from several firms and by noon of the next business day practically all had been heard from. The house originating this issue reported that they had never experienced such satisfactory service nor had they ever had as prompt replies as in this case. The recipients of the Telephotographs explained that they were able to visualize the details to better advantage in the form of a Telephotographic print.

Another use of Telephotographs in financial transactions is of interest. It has been the practice of a large corporation with its Treasurer located in New York and stock transfer offices in Boston and Chicago, to send

messages in code between these offices relating to stock transfers and the issuing of new certificates. The need of accuracy in such matters is paramount and the use of Telephotographs has demonstrated clearly that errors are practically impossible unless the error is made in the original copy. Doubtless many concerns in the United States could adopt this method of approving stock transfers to advantage.

When important changes in the financing of an institution take place it is legally necessary to publish the details in certain newspapers for a given period of time so that those holding securities may be advised of the changes. In such cases Telephotographs may be transmitted to multigraph bureaus in the various Telephotograph station cities, which bureaus can duplicate the copy and send it by mail to the newspapers concerned. The cost of transmission of such copy usually is less than if transmitted by other rapid means, especially when several cities are included.

The use of Telephotographs for the transmission of monthly balance sheets or operating data from branch offices or plants to the general offices has developed during the past year and this means of transmission has resulted in prompt and accurate information being received. One firm which has been using this method for more than a year from one point to another now is increasing the use to include three other points.

Advertisements by Telephotograph

Newspapers advertisements consisting of line drawings and type have been successfully transmitted and electrotypes of the complete advertisement made directly from the Telephotograph. This is a great advantage where speed is required due to last minute changes in advertising copy or plans.

Early this spring a millinery association in New York gave a fashion show at which new styles in millinery

FIG. 1 FIG. 2

Fig. 1 is a Telephotograph of afternoon dress styles used in newspaper advertising.
Fig. 2 is one of several millinery designs sent in telephotograph form from the Annual Spring Fashion Show to stores and buyers.

FIG. 3

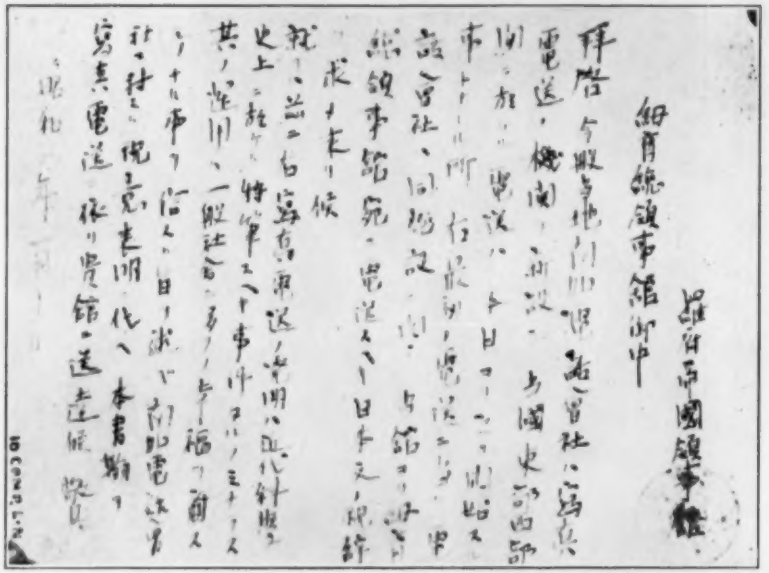


FIG. 4

Fig. 3 is a news cartoon from Washington transmitted as a telephotograph.
Fig. 4 illustrates telephotography as the only way of transmitting foreign languages by wire without disrupting service.

were shown. Arrangements were made to secure about a dozen pictures of models wearing the new styles. These pictures were transmitted by wire to the eight terminal cities, printed on art paper and delivered to the principal newspapers in the eight cities, resulting in a large amount of favorable publicity. In addition, a full page description of the Telephotograph process and its advantages to those interested in securing the latest styles was published by the Association and sent to over 6,500 wholesale and retail milliners in the United States.

An interesting development in the millinery trade as a result of this experiment was the demand for flower covered hats. For a number of years there has been very little call for artificial flowers for hat decoration and this spring, much to the surprise of the trade, calls for flowers suddenly developed throughout the country. Upon investigation it was found that two of the pictures which were transmitted were of flowered hats designed especially for the tea dansant. These hats were particularly attractive, and illustrations were published by a great many newspapers. The impression was gained generally that flowered hats were again in vogue and the immediate demand for flowers is attributed by the millinery people to these pictures.

Another interesting development followed the transmissions for the Millinery Association. At a meeting of the Committee of the Industry in New York, leather colors were chosen for the fall of 1927. A prominent shoe manufacturer interpreted these colors in shoes of the latest styles and pictures of the shoes with the captions descriptive of the colors were released. Eight shoe pictures, together with a suitable cover and explanatory message, were bound with ribbon and distributed among manufacturers and retailers throughout the country to the extent of 150 copies. These were printed on art paper. Glossy black and white prints for reproduction purposes were delivered to the newspapers and considerable publicity followed. The booklet indicated to the

buyers the possibility of receiving illustrations of styles quickly and in a form suitable for immediate use. Compared with a written description the advantages are obvious. As a result of this experiment manufacturers of shoes now are using Telephotographs for the transmission of advertising matter.

The millinery pictures and the shoe booklet have created great interest and have resulted in many inquiries in other lines of business. Commercial results on a considerable scale already have resulted from these transmissions.

The use of Telephotographs for promoting the sale of women's dresses may also be cited. At the opening of the Atlanta Telephotograph office, one of the department stores in that city had sent to them from New York pictures of two dresses. These were used in newspaper advertisements and in the store to further a sale of these two styles. The management of the store reported that over 50% of the purchases in the dress department on the day of the sale were of the styles which had been given advance publicity by the Telephotograph illustrations.

Other department stores throughout the country also have been transmitting style pictures which are used not only in their newspaper advertising, but also in the development of window displays.

Telephotographs for the Legal Profession

The use of Telephotographs for the transmission of documents and other matter used in litigation is one which has attracted attention from the very first, but it is only recently that such pictures have been accepted as evidence in court. A case in point is one which was heard in Boston in which a Telephotograph of a contract transmitted from Chicago resulted in vacating a temporary injunction and a hold over for another hearing before a permanent injunction could be granted.

Another case which is of interest to financial houses as well as the legal profession recently developed. During the month of April this year a large underwriting house in New York City was in the process of underwriting a new issue. To complete the transaction it was necessary that thirteen previous issues be legally retired. This necessitated the appearance of an advertisement in certain newspapers for a given period of time to announce the fact that these issues were about to be retired.

The day for the completion of the negotiations was at hand. The bankers, lawyers and financiers were in conference at a New York bank, the Trustee of the new issue. A check was made of the affidavits from the newspaper proprietors certifying that the advertisements of the retiring of the issues had appeared as required.

In the check-up it was discovered that no affidavit was at hand from a large newspaper in Chicago. Copies of this newspaper showing the advertisement with the dates of publication were in the office, but the lawyers for the Trustee of the bonds being called were not satisfied of the fact that this advertisement had appeared in all issues. The underwriters were in a quandary. If the affidavit were not received by five o'clock a postponement of the issue for 60 days would be necessary and the negotiations would have to be repeated. To obtain the affidavit from the publisher before the close of the meeting seemed impossible.

Someone suggested Telephotograph. Immediately the Chicago publisher was reached on the long distance telephone and requested to make the required affidavit. This was rushed to the Telephotograph office in Chicago, photographed and transmitted to New York, where it was brought before the meeting in accordance with legal requirements. The deal was concluded.

What would have been the financial loss, not to mention time and worry had Telephotographs not been available? We will leave that to your imagination.

The cost of the transmission was $20.

Greetings by Telephotographs

Various ways of bringing Telephotographs to the attention of the public in general are being tried. One of these is the sending of personal greetings on holidays such as Christmas, New Year's, Easter and Mother's Day.

During the Christmas Holidays posters were displayed in the studios of the principal photographers in the cities served and the idea was given publicity by the daily press. Such greeting pictures usually were autographed.

Possible Uses in Other Fields

Above has been outlined the daily uses of Telephotographs. In addition to these there are other fields which logically must use such means of transmission in due time. Among these we may consider the following:

Moving Pictures

One of the most promising fields has been the transmission of motion picture films. The present apparatus is not well adapted to this particular field but there is no reason to believe that apparatus having the proper characteristics would be difficult to manufacture. The producers of news reels particularly are desirous of being able to transmit sections of films from distant points and thus display to audiences in different cities views of events on the day of occurrence.

Foreign Languages and Code

The use of Telephotographs for the transmission of messages in foreign languages employing characters different from those usually used, such for example as Chinese or Japanese, has been found satisfactory, but has not been done in a practical way in many instances. Such messages cannot be transmitted by wire or by any other rapid method unless translated into English or unless transmitted in the form of speech. In such cases

or where code is employed Telephotographs possess advantages, particularly accuracy, over other methods of rapid transmission.

Formulæ

The transmission of mathematical and chemical formulæ by Telephotograph has been considered but has not been put into practice. Of course, it is perfectly feasible. In fact, Telephotographs have no competitor in this field as it is extremely difficult to transmit the component parts of an intricate formula and assemble those component parts in the proper relation by any other means

Drawings

Mechanical and architectural drawings have been transmitted in a few instances with complete success. The advantages of sending a facsimile of an intricate drawing, together with the dimensions are too obvious to need elaboration.

In one case the drawing of a rudder part was transmitted to headquarters at New York and permitted replacement parts to be cast and sent immediately, whereas the use of the regular mail would have caused a delay of several days.

It is believed that Telephotographs eventually will be used extensively for the transmission of mechanical drawings, architectural designs, maps, and similar illustrative material.

It has recently been suggested that fire insurance companies could use Telephotographs to advantage in sending building plans and plant layouts to the home office for approval where immediate coverage is necessary or desirable.

The foregoing indicates some of the possibilities of this new means of communication. Like all other new services, it must be brought to the attention of the users and they must be instructed in its uses until it takes its

place in its proper sphere in the same way as the mail, the telegraph and the telephone.

The commercial uses of Telephotographs are expanding rapidly. Hardly a day passes that an emergency does not arise necessitating their use in a new field and often these emergencies result in the continued use of Telephotographs because of the prime need of accuracy and speed.

To dwell on the thought that a picture or written matter in all its detail of light and shade can be reproduced and delivered across the continent in an hour is indeed a tribute to scientific research. A few years ago the acceptance of this thought as fact would have strained to the breaking point the credulity of the most optimistic scientist. Today we see again the miracle rapidly becoming another business necessity of our day and age.

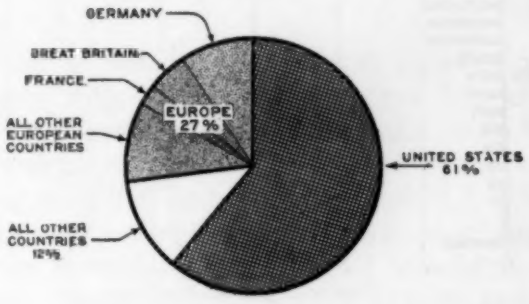
W. E. HARKNESS.

World's Telephone Statistics
January 1, 1926

THE World little noted the invention of the telephone fifty years ago, but with the passage of each year since that time the instrumentality which the invention created has been found to have made an increasing contribution to the social and economic welfare of mankind. The latest world survey of telephone growth and development indicates that there were on January 1, 1926, a total of 27,783,963 telephones throughout the world, or 1,727,465 more than there were on January 1, 1925. This increase of over 6% in

DISTRIBUTION OF THE WORLD'S TELEPHONES

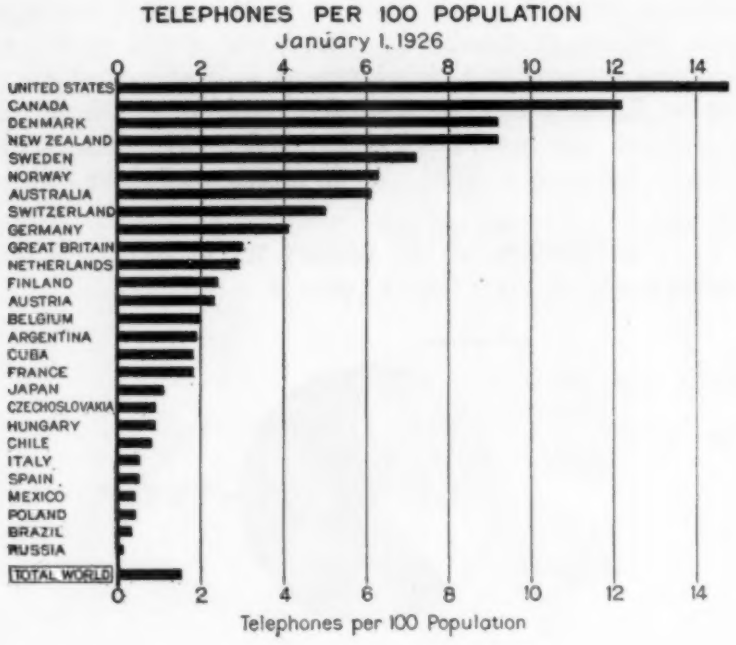
— January 1, 1926 —



the number of telephones during 1925 appears more significant when it is recalled that there were hardly more than 1,700,000 telephones in the whole world at the beginning of this century. Of the total number of telephones in the world on January 1, 1926, 16,935,918, or 61%, were in the United States, and nearly 99% of these telephones were either owned by, or connected to, the Bell System. On the same date Europe had 7,479,690 telephones, or 27% of the world's total, while the remaining 12% were distributed among the countries of

Asia, Africa, Oceania, South America, and North America other than the United States.

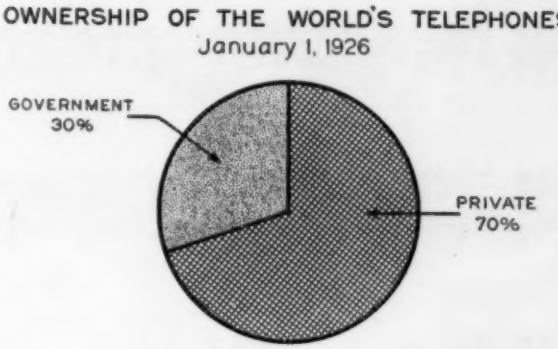
The survey mentioned above involved the gathering of authoritative information through correspondence carried on by the Chief Statistician's Division of the American Telephone and Telegraph Company with telephone officials in all foreign countries. As in former



years, the data collected have been collated and printed as a pamphlet from which the accompanying tables and charts have been reproduced.

The table on "Telephone Development of the World, By Countries" shows that, of 19,389,360 telephones operated by private companies throughout the world on January 1, 1926, 16,935,918 were located within the United States. This fact is more significant when it is also noted that the United States is far ahead of all

other countries both in the total number of telephones in use and in the number of telephones as related to population. Thus, there were 14.8 telephones per 100 population in the United States, as compared with 1.5 telephones per 100 of Europe's population; in the latter continent over 88% of the telephones were operated by government systems. At the beginning of 1926 Canada



ranked second to the United States in point of telephone development, with 12.2 telephones per 100 of its inhabitants. Denmark and New Zealand with 9.2 were tied for third place, and were followed by Sweden with 7.2, Norway with 6.3, and Australia with 6.1. Germany, which ranks next to the United States in absolute number of telephones in service, had only 4.1 telephones per 100 inhabitants. Great Britain and Northern Ireland had 3.0 telephones per 100 population, while France had only 1.8 telephones per 100 of its people.

In considering these statistics it is interesting to know that the United States has not always led Europe in the number of telephones. In 1885, ten years after the telephone's birth, the United States with 155,700 telephones did lead Europe by almost two telephones to one. However, by the end of 1891 Europe with 254,900 telephones had passed the United States which had only 239,300 telephones. For nearly seven years thereafter,

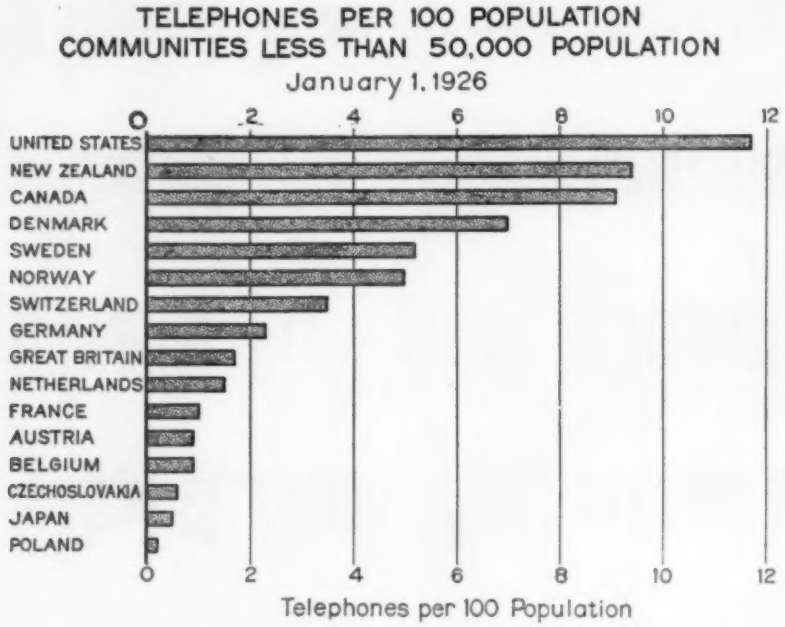
TELEPHONE DEVELOPMENT OF THE WORLD, BY COUNTRIES
January 1, 1926

	Number of Telephones					
	Government Systems	Private Companies	Total	Per Cent of Total World	Telephones per 100 Population	Increase in Number of Telephones During 1925
NORTH AMERICA:						
United States	.....	16,935,918	16,935,918	60.96%	14.8	863,160
Canada	208,982	935,113	1,144,095	4.12%	12.2	71,641
Central America	8,556	11,458	20,014	.07%	0.3	2,084
Mexico	2,091	52,374	54,465	.20%	0.4	3,485
West Indies:						
Cuba	545	61,569	62,114	.22%	1.8	7,200
Porto Rico	806	11,954	12,760	.05%	0.9	646
Other W. I. Places*	6,340	11,535	17,875	.06%	0.3	2,614
Other No. American Places*	85	3,936	4,021	.01%	1.1	213
Total	227,405	18,023,857	18,251,262	65.69%	11.6	951,043
EUROPE:						
Austria	153,043	.....	153,043	.55%	2.3	7,902
Belgium	159,072	.....	159,072	.57%	2.0	22,128
Bulgaria*	9,000	.....	9,000	.03%	0.2	903
Czechoslovakia	120,548	.....	120,548	.43%	0.9	4,810
Denmark	13,281#	303,116	316,397	1.14%	9.2	8,420
Finland	.....	85,000	85,000	.31%	2.4	2,000
France	737,198	.....	737,198	2.65%	1.8	77,071
Germany	2,588,016	.....	2,588,016	9.31%	4.1	202,839
Great Britain and No. Ireland	1,379,656	.....	1,379,656	4.97%	3.0	115,632
Greece*	5,500	.....	5,500	.02%	0.1	50
Hungary	78,451	.....	78,451	.28%	0.9	—161
Irish Free State (March 31, 1926)	21,853	.....	21,853	.08%	0.7	212
Italy (June 30, 1926)*	.....	200,000	200,000	.72%	0.5	18,000
Jugo-Slavia	29,942	.....	29,942	.11%	0.2	2,000
Latvia (March 31, 1926)	18,843	.....	18,843	.07%	1.0	3,286
Netherlands	214,041	.....	214,041	.77%	2.9	11,173
Norway	100,955‡	72,797	173,752	.63%	6.3	5,234
Poland	68,221	52,009	120,230	.43%	0.4	8,559
Portugal	2,500*	18,456	20,956	.08%	0.3	1,200
Roumania	41,755	.....	41,755	.15%	0.2	7,175
Russia§	192,782	.....	192,782	.69%	0.1	30,000
Spain*	.....	113,000	113,000	.41%	0.5	8,000
Sweden	434,594	1,746	436,340	1.57%	7.2	18,022
Switzerland	195,525	.....	195,525	.70%	5.0	6,096
Other Places in Europe*	54,750	14,040	68,790	.25%	0.8	6,000
Total	6,619,526	860,164	7,479,690	26.92%	1.5	566,551

SOUTH AMERICA:						
Argentina	.....	189,036	189,036	.66%	1.9	15,431
Bolivia†	.....	1,824	1,824	.01%	0.1	.....
Brazil	632	102,352	102,984	.37%	0.3	4,420
Chile	.....	35,164	35,164	.13%	0.8	4,269
Colombia	50	17,292	17,342	.06%	0.2	2,419
Ecuador†	1,691	2,827	4,518	.02%	0.2	.....
Paraguay†	183	278	461	.01%	0.04	.....
Peru	.....	11,000	11,000	.04%	0.2	1,448
Uruguay	.....	26,051	26,051	.10%	1.6	810
Venezuela	560	11,495	12,055	.04%	0.4	1,008
Other Places	2,642	.....	2,642	.01%	0.5	115
Total	5,758	397,319	403,077	1.45%	0.5	29,920
ASIA:						
British India (March 31, 1926)	15,050	28,189	43,239	.16%	0.01	1,999
China*	82,168	35,606	117,774	.43%	0.03	5,704
Japan (March 31, 1926)	636,736	.....	636,736	2.29%	1.1	92,303
Other Places in Asia*	100,883	7,954	108,837	.39%	0.1	4,172
Total	834,837	71,749	906,586	3.27%	0.1	104,178
AFRICA:						
Egypt	35,744	.....	35,744	.13%	0.2	1,936
Union of South Africa♯	80,689	.....	80,689	.29%	1.1	9,241
Other Places in Africa*	52,929	1,086	54,015	.19%	0.05	5,768
Total	169,362	1,086	170,448	.61%	0.1	16,945
OCEANIA:						
Australia (June 30, 1925)	362,949	.....	362,949	1.30%	6.1	44,670
Dutch East Indies	37,561	3,402	40,963	.15%	0.01	1,694
Hawaii	.....	18,804	18,804	.07%	6.4	1,097
New Zealand (March 31, 1926)	130,186	.....	130,186	.47%	9.2	10,089
Philippine Islands	4,517	12,449	16,966	.06%	0.1	1,000
Other Places in Oceania*	2,502	530	3,032	.01%	0.2	278
Total	537,715	35,185	572,900	2.06%	0.8	58,828
TOTAL WORLD	8,394,603	19,389,360	27,783,963	100.00%	1.5	1,727,465

* Partly estimated.
♯ March 31, 1926.
‡ June 30, 1925.
§ Including Siberia and Associated Republics.
† January 1, 1925.

Europe continued to lead the United States in number of telephones by a comfortable margin. In fact, it was not until the latter part of 1898 that the United States again had more telephones than Europe, and the excess has been steadily increasing ever since. The table on telephone development shows that at the present time the 1885 ratio of two telephones in the United States to one in Europe has even been surpassed. It should



always be remembered, however, that during the period when Europe actually had more telephones, the United States was always better developed telephonically, since Europe's populations exceeded that of this country by about five to one.

In South America, Argentina was the best developed country from a telephone standpoint, according to the table. However, as compared with North American standards, Argentina, with only 1.9 telephones per 100

TELEPHONE DEVELOPMENT OF LARGE AND SMALL COMMUNITIES

January 1, 1926

Country	Service Operated by (See Note)	Number of Telephones		Telephones per 100 Population	
		In Communities of 50,000 Population and Over	In Communities of less than 50,000 Population	In Communities of 50,000 Population and Over	In Communities of less than 50,000 Population
Austria	G.	112,664	40,379	5.0	0.9
Belgium	G.	117,879	41,193	3.8	0.9
Canada	P. G.	528,166	615,929	20.6	9.1
Czechoslovakia	G.	44,913	75,635	4.0	0.6
Denmark	P. G.	137,472	178,925	15.6	7.0
France	G.	426,955	310,243	5.0	1.0
Germany	G.	1,571,361	1,016,655	7.8	2.3
Great Britain and Northern Ireland‡	G.	1,032,433	379,027	4.4	1.7
Japan‡	G.	383,077	253,659	3.8	0.5
Netherlands	G.	139,924	74,117	5.4	1.5
New Zealand‡	G.	46,524	83,662	9.0	9.4
Norway	P. G.	55,917	117,835	13.7	5.0
Poland	P. G.	63,913	56,317	2.2	0.2
Sweden	G.	162,964	273,376	19.4*	5.2
Switzerland	G.	85,760	109,765	11.1	3.5
United States	P.	8,659,943	8,275,975	19.8	11.7

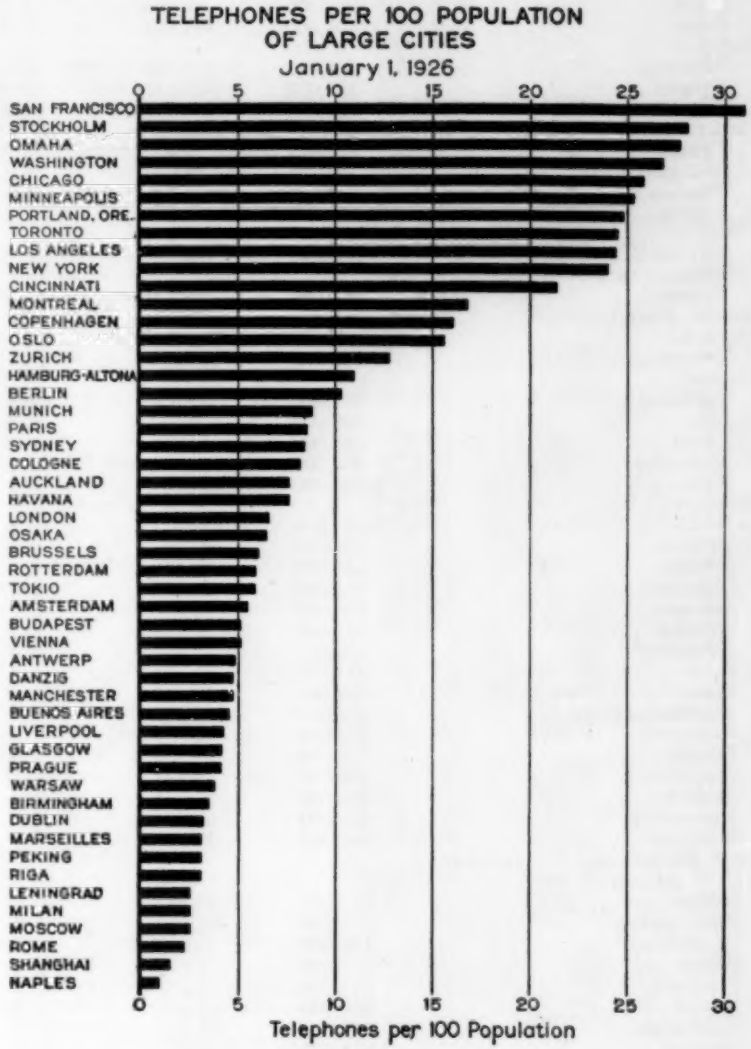
Note: P. indicates telephone service operated by Private Companies, G. by the Government, and P. G. by both Private Companies and the Government.
‡ March 31, 1926.
* The majority of this development is due to Stockholm

population, and South America in general, have much to hope for in the way of the expansion of telephone facilities. For instance, the telephone development of South America was only one-third that of Europe as a whole, which in turn was but slightly more than one-tenth of the telephone development of the United States. Japan, with only 1.1 telephones per 100 persons, had the majority of the telephones used in Asia. This low telephone development does not imply, necessarily, that the Japanese as a people are slow to value the telephone, since it is a well known fact that the Japanese Government has long been unable fully to supply the demands made upon it for new telephone service.

The table on "Telephone Development of Large and Small Communities" indicates that the distribution of telephones with respect to the size of communities is more favorable to the smaller communities in the United States than to such communities in any European country. In general, by far the greatest use of the telephone in foreign countries is to be found in the larger cities. In the United States, however, telephone men and the farmers themselves early realized the value of the telephone to rural communities. The success which has attended the extension of telephone lines into rural sections throughout continental United States justifies the initiative and foresight responsible for such expansion. The figure for the telephone development of communities under 50,000 population in the United States, namely 11.7 telephones per 100 population, indicates a development for smaller places in America greater than the total telephone development of any country other than Canada. New Zealand and Canada rank second and third in respect of telephone facilities offered to their smaller communities. In the large European countries, however, rural development is almost negligible despite many insistent demands for improvement in this type of service.

The concentration of telephones in the larger cities in

the case of foreign countries is set forth by the table on "Telephone Development of Large Cities." From this table it is seen that London had more than one-third of the total telephone instruments in Great Britain. Paris, with only 255,561 telephones, also had more than one-third of the total number of telephones in France.



TELEPHONE DEVELOPMENT OF LARGE CITIES
January 1, 1926

Country and City (or Exchange Area)	Estimated Population (City or Exchange Area)	Number of Telephones	Telephones per 100 Population
ARGENTINA:			
Buenos Aires	2,310,000	104,281	4.5
AUSTRALIA:			
Adelaide	304,000	24,838	8.2
Brisbane	264,000	18,477	7.0
Melbourne	912,000	73,694	8.1
Sydney	1,039,000	87,504	8.4
AUSTRIA:			
Gratz	157,000	7,146	4.6
Vienna	1,919,000	98,226	5.1
BELGIUM:			
Antwerp	490,000	23,279	4.8
Brussels	892,000	54,798	6.1
Charleroi	184,000	4,832	2.6
Ghent	268,000	6,696	2.5
Liege	408,000	11,331	2.8
CANADA:			
Montreal	821,000	138,225	16.8
Ottawa	180,000	33,547	18.6
Toronto	633,000	154,740	24.5
CHINA:*			
Canton	925,000	3,000	0.3
Shanghai	1,560,000	24,000	1.5
Tientsin	830,000	7,770	0.9
Peking	1,350,000	41,294	3.1
CUBA:			
Havana	563,000	42,860	7.6
CZECHOSLOVAKIA:			
Prague	704,000	29,049	4.1
DANZIG, FREE CITY OF	373,000	17,497	4.7
DENMARK:			
Copenhagen	755,000	121,286	16.1
FRANCE:			
Bordeaux	276,000	12,579	4.6
Lille	207,000	9,883	4.8
Lyons	580,000	18,501	3.2
Marseilles	605,000	18,528	3.1
Paris	2,995,000	255,561	8.5
GERMANY:			
Berlin	4,034,000	415,871	10.3
Bremen	296,000	27,161	9.2
Breslau	558,000	36,486	6.5
Chemnitz	334,000	20,785	6.2
Cologne	701,000	57,563	8.2
Dresden	622,000	50,139	8.1
Düsseldorf	433,000	33,919	7.8
Essen	471,000	21,273	4.5
Frankfort-on-Main	464,000	50,980	11.0
Hamburg-Altona	1,270,000	139,107	11.0
Hannover	424,000	30,897	7.3
Leipzig	682,000	57,586	8.4
Magdeburg	293,000	18,892	6.4
Munich	696,000	61,537	8.8
Nuremberg	468,000	30,633	6.5
Stuttgart	343,000	34,538	10.1
GREAT BRITAIN AND NO. IRELAND: (March 31, 1926)			
Belfast	415,000	12,371	3.0
Birmingham	1,069,000	37,394	3.5
Blackburn	127,000	3,697	2.9
Bolton	179,000	4,655	2.6
Bradford	314,000	15,100	4.8
Bristol	390,000	13,647	3.5
Edinburgh	420,000	21,372	5.1
Glasgow	1,119,000	45,957	4.1
Hull	341,000	14,904	4.4
Leeds	482,000	16,742	3.5
Liverpool	1,116,000	46,556	4.2
London	7,406,000	488,499	6.6
Manchester	1,055,000	49,944	4.7
Newcastle	458,000	15,961	3.5
Nottingham	293,000	11,955	4.1
Plymouth	210,000	4,820	2.3
Sheffield	491,000	15,019	3.1

* Partly estimated.

TELEPHONE DEVELOPMENT OF LARGE CITIES—(Concluded)

January 1, 1926

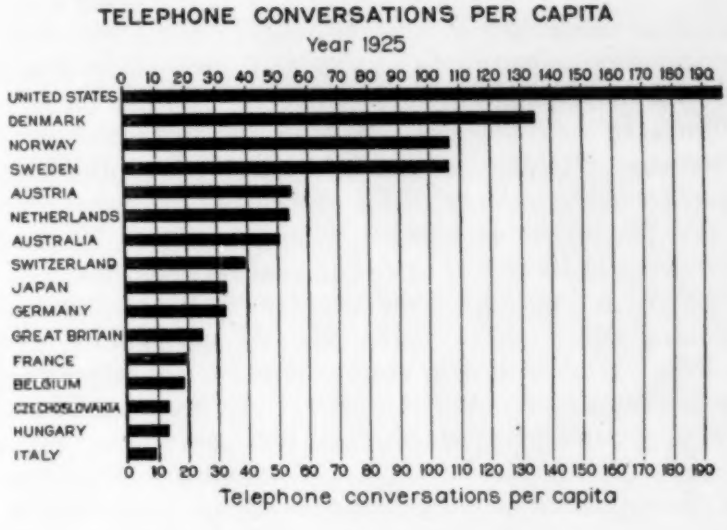
Country and City (or Exchange Area)	Estimated Population (City or Exchange Area)	Number of Telephones	Telephones per 100 Population
HUNGARY: (January 1, 1925)			
Budapest	953,000	48,680	5.1
Szegedin	113,000	2,083	1.8
IRISH FREE STATE: (March 31, 1926)			
Dublin	406,000	12,917	3.2
ITALY: (June 30, 1923)			
Milan	714,000	17,992	2.5
Naples	785,000	6,786	0.9
Rome	648,000	14,261	2.2
Turin	509,000	7,953	1.6
JAPAN: (March 31, 1926)			
Kobe	652,000	24,642	3.8
Kyoto	698,000	24,181	3.5
Nagoya	802,000	21,629	2.7
Osaka	1,187,000	76,845	6.5
Tokio	2,069,000	121,856	5.9
Yokohama	412,000	13,456	3.3
LATVIA: (March 31, 1926)			
Riga	340,000	10,624	3.1
NETHERLANDS:			
Amsterdam	718,000	39,644	5.5
The Hague	398,000	29,070	7.3
Rotterdam	552,000	32,323	5.9
NEW ZEALAND: (March 31, 1926)			
Auckland	193,000	14,655	7.6
Christchurch	118,000	10,055	8.5
Wellington	122,000	14,656	12.0
NORWAY: (June 30, 1925)			
Oslo	254,000	39,682	15.6
POLAND:			
Warsaw	960,000	36,314	3.8
ROUMANIA:			
Bucharest*	365,000	11,730	3.2
RUSSIA:			
Kazan	170,000	1,566	0.9
Kharkov	388,000	4,800	1.2
Leningrad	1,511,000	38,418	2.5
Moscow	1,913,000	48,378	2.5
Odessa	390,000	2,598	0.7
SPAIN:			
Barcelona	710,000	18,596	2.6
Madrid	751,000	17,857	2.4
Seville	206,000	1,814	0.9
Valencia	251,000	3,262	1.3
SWEDEN:			
Göteborg	231,000	28,993	12.5
Malmö	116,000	14,893	12.8
Stockholm (excluding Bromma Brännkyrka)	381,000	107,173	28.1
SWITZERLAND:			
Basel	138,000	14,512	10.5
Berne	108,000	12,222	11.3
Geneva	126,000	15,497	12.3
Zürich	207,000	26,524	12.8
UNITED STATES:**			
New York	5,896,000	1,415,108	24.0
Chicago	3,059,000	790,711	25.8
Los Angeles	1,150,000	280,754	24.4
Total of the 8 cities with over 1,000,000 population	17,419,000	3,840,327	22.0
San Francisco	695,000	215,464	31.0
Cincinnati	657,000	140,547	21.4
Milwaukee	605,000	120,924	20.0
Total of the 10 cities with 500,000–1,000,000 population	6,546,000	1,206,930	18.4
Washington	482,000	129,405	26.8
Minneapolis	457,000	115,833	25.3
Portland, Ore	341,000	84,432	24.8
Omaha	223,000	61,601	27.7
Total of the 30 cities with 200,000–500,000 population	8,675,000	1,701,905	19.6
Total of the 48 cities with over 200,000 population	32,640,000	6,749,162	20.7

* Partly estimated.

** There are shown, for purposes of comparison with cities in other countries, the total development of all cities in the United States in certain population groups and the development of certain representative cities within each of such groups.

The distribution of telephones in Germany, while more uniform than in either Great Britain or France, is still largely concentrated within its larger cities. Another fact brought out by this table is of interest, namely, that it is exceptional for a city outside of the United States or Canada to have as many as 15 telephones per 100 inhabitants. The large cities of the United States are much superior in point of telephone development when compared with foreign cities. For instance, New York in relation to its population had nearly four times as many telephones as London, nearly three times as many as Paris, and over twice as many as Berlin. At the same time, in absolute numbers, New York City had many more telephones than the whole of Great Britain and Northern Ireland; Chicago had more telephones than France; San Francisco had more telephones than Italy; while Omaha, with a population of only 223,000 people, had about one-third as many telephones as the whole of Russia with its 140,000,000 inhabitants. The highest telephone development among the cities shown in this table is that for San Francisco, with 31.0 telephones per 100 inhabitants. This does not mean, however, that San Francisco is the best developed community in the world in point of telephone facilities, but merely that it is the best developed city with a population of 200,000 or more. There are many smaller places in the United States having a telephone development higher than San Francisco's. The best developed foreign city shown by this table is Stockholm, with 28.1 telephones per 100 population. This development was mainly the result of the activity of a private telephone company operating in Stockholm, which was taken over by the national Government several years ago. Stockholm's experience, however, is not indicative of telephone development generally in Sweden, since the nearest approach to its development by any other large Swedish city was in the case of Malmö, which had only 12.8 telephones per 100 population.

The chart entitled, "Telephone Conversations Per Capita," indicates the comparative use of telephone service during 1925. As in other telephone data, the United States again leads the world, with 196 telephone conversations per capita in that year. The American people use their telephone facilities six times as much as do the people of Germany, where only 32 conversations per capita in 1925 were recorded, even though that country, as previously stated, ranked second to the United States as regards the number of telephones in



service. Denmark with 135 conversations per capita ranked next to the United States, followed by Norway and Sweden with 107 and 106 conversations per capita, respectively. Farther down the list Japan, with 33 conversations per capita, outranked Great Britain and France with 25 and 20, respectively.

Over fifty years ago, on June 2, 1875, an almost inaudible "twang" caught by the sensitive ear of an expert was instrumental in bringing forth the telephone. That

twang was a factor in paving the way for the vast network of "talk tracks" now to be found throughout the World. Over these tracks, in the United States alone, there were carried during 1925, twenty-two billion, four hundred million, completed conversations—equivalent to one conversation every *second* for over seven hundred years!

The Television Demonstration

TELEVISION, the dream of romancers and a seemingly distant goal of engineers, became an actuality, demonstrated between cities more than two hundred miles apart on April 7th when not only the words of greeting but also the smiling, animated countenance of Herbert Hoover, Secretary of Commerce of the United States, were transmitted from Washington to President Walter S. Gifford of the American Telephone and Telegraph Company and an expectant New York audience.

This first public demonstration of television—a development of the Bell Telephone Laboratories, which bears the same relation to sight that the telephone does to sound—included not only the transmission of life-like reproductions by wire but also a similarly successful transmission by radio from 3XN, the experimental radio station of the Laboratories, located at Whippany, N. J.

The combined achievement was the result of researches and apparatus developments covering a period of several years planned by Dr. Herbert E. Ives, and conducted by him and by other members of the technical staff of the Laboratories. It is estimated that two hundred engineers, scientists, and technicians contributed to the success of the project.

Participating in the demonstration at Washington and New York were notable gatherings of government officials and of leaders in the fields of science, industry and public affairs. Mr. Gifford presided in the auditorium of the Bell Telephone Laboratories and, before the demonstration spoke briefly to the spectators assembled there:

Mr. Gifford's Address

"Today we are to witness another mile-stone in the conquest of nature by science. We shall see the fruition of years of study on the problem of seeing at a distance

as though face to face. The principles underlying television, which are related to the principles involved in electrical transmission of speech, have been known for a long time but today we shall demonstrate its successful achievement. The elaborateness of the equipment required by the very nature of the undertaking precludes any present possibility of television being available in homes and offices generally. What its practical use may be I shall leave to your imagination. I am confident, however, that in many ways and in due time it will be found to add substantially to human comfort and happiness.

"It is our constant aim to furnish this country with the most complete telephone service possible. In connection with that aim, we endeavor to develop all forms of communication that might be supplemental to the telephone. With that in view, we shall continue our work on television which, although not directly a part of telephone communication, is closely allied to it."

Mr. Gifford then introduced Dr. Frank B. Jewett, Vice-President of the American Telephone and Telegraph Company in charge of development and research, and President of the Bell Telephone Laboratories. Dr. Jewett stressed the methods and aims of the Laboratories, as follows:

Dr. Jewett's Address

"The demonstration of television which you have been invited to witness today is to be in fact what the name implies—'far vision.' You will see and converse with people as far away as Washington and with others not so distant. That those with whom you converse will not see you is primarily because for this demonstration it did not seem necessary to provide the equipment for complete two-way working, and not because of any inherent obstacle.

"As Mr. Gifford has stated, the general principles underlying television have been known for a long time. It is one thing to appreciate general principles, however,

and frequently quite another to realize them practically. In the case of television many of the elements long recognized as essentials to success were not possible of attainment until general science had been farther advanced. But even when recently fundamental research work developed new knowledge, new materials and new methods, the problem of successful television demanded a vast amount of coordinated research and development work to crystallize scientific possibilities into practical realities.

"The research and development functions of the Bell System, of which these Laboratories are a most important part, are organized for the solution of just such problems. The American Telephone and Telegraph Company has organized its scientific work to provide in one great coordinated science institution every facility needed for the solving of intricate problems of distant electrical communication. Scientists competent to develop new knowledge work in close association with other scientists and engineers seeking practical solutions for a host of problems.

"When some years ago it began to be evident that scientific knowledge was advancing to the point where television was shortly to be within the realm of the possible, we took up seriously a study of the problems involved. Under the supervision of Dr. Ives research and development on the various elements of terminal equipment and connecting channels was undertaken. As a result of this coordinated work we are today in position to view scenes and actions at a distance and to employ in their transmission either telephone wires or radio waves. To accomplish this result much fundamental research work was required, many new things had to be devised and many old principles were applied under the guidance of recently acquired scientific knowledge. Principal in all this has been the knowledge obtained during the past few years in the research and development which has made possible transcontinental and transoceanic telephony and telephotography.

"The demonstrations in which you will participate today are designed to show you not merely laboratory achievements over short distances within the walls of a building but also transmission over very long distances. You will see and converse with people whom you know are hundreds of miles away. They might equally well be thousands of miles away. To show you that television is not confined to any single medium of transmission we have arranged that you shall witness television both over wires such as are employed in long distance telephony and by radio. From Washington, D. C., you will have transmission wholly by wires, while from the Laboratories' great radio experimental station at Whippany, N. J., you will have simultaneous sight and sound by radio. That television from either place is not inferior to that obtained within the laboratory itself you will have opportunity to prove with the apparatus which we have assembled at the two ends of this auditorium.

"While research and development work for the perfection of television will go on for years, enough has already been accomplished to indicate that it is likely to have a real place in the world's work of distant communication. Today we are relatively farther along in our work on television than we were on transoceanic telephony in 1915 when the American Telephone and Telegraph Company conducted the first successful test from Washington to Paris and Honolulu. Just what the ultimate field of television is to be can, as Mr. Gifford has said, be left to your imagination. The one thing that seems clear is that it will be a use closely associated with telephony.

"In attempting to form a picture as to the future development of television there is one inherent limitation of any television method which we should keep clearly in mind, however. This is the fact that it requires the use of a large group of frequencies and the transmission of these frequencies requires as great capacity as a con-

siderable number of ordinary telephone circuits. It is this fact which puts television economically in a class quite different from that of ordinary telephony or telegraphy.

"In order that you may fully appreciate what is involved in the long distance demonstrations from Washington and Whippany I am going to ask Dr. Ives to explain briefly the mechanism of the transmitting and receiving apparatus and show it to you in operation here where you can, as it were, be in two places at once."

Dr. Ives outlined clearly the problems presented in achieving successful television and showed how these problems had been met, illustrating his talk with various pieces of laboratory equipment which had been developed in the early stages of the research work.

Following the preliminary description of apparatus and method, Mr. Gifford seated himself before the receiving apparatus for television, the long distance connection was established with Washington, and he conversed with Secretary Hoover whose facial expressions were visible with distinctness in the small rectangular opening of the receiving apparatus.

After a short conversation, Mr. Hoover addressed Mr. Gifford and the guests who were assembled with him. Switches were thrown to connect with a large screen set up before the guests on the stage of the auditorium and to connect the telephone circuit with a loud-speaking receiver. Mr. Hoover's face as he talked was thus made visible to the entire audience as they listened to his message electrically amplified:

Secretary Hoover's Address

"It is a matter of just pride to have a part in this historic occasion. We have long been familiar with the electrical transmission of sound. Today we have in a sense the transmission of sight for the first time in the world's history.

"Human genius has now destroyed the impediment of

distance in a new respect, and in a manner hitherto unknown. What its uses may finally be no one can tell any more than man could foresee in past years the modern development of the telegraph or the telephone. All we can say today is that there has been created a marvelous agency for whatever use the future may find. Every great and fundamental discovery of the past has been followed by use far beyond the vision of its creator. Every school child is aware of the dramatic beginnings of the telegraph, the telephone, and the radio, and this evolution in electrical communications has perhaps an importance as vital as any of these.

"This invention again emphasizes a new era in approach to important scientific discovery of which we have already within the last two months seen another great exhibit, the transatlantic telephone. It is the result of organized plan and definitely directed scientific research magnificently coordinated in a cumulative group of skilled scientists, loyally supported by a great corporation devoted to the advancement of the art. The intricate processes of this invention could never have been developed under any conditions of isolated individual effort.

"The world is under obligation to the American Telephone and Telegraph Company for its vision in the establishment and support of these Laboratories and does tribute to all those who have played their part in this development.

"These Laboratories have produced a long list of additions to the telephonic art and a constant contribution to other arts, but no one of them more dramatic or more impressive than this.

"I always find on these occasions a great stimulation to confidence in the future. If we can be assured a flow of new and revolutionary inventions to maintain thought, stimulate spirit and to provide a thousand new opportunities for effort and service, we will have preserved a vital and moving community.

"I am glad to welcome television as the latest product of scientific discovery which promises that where the voice has lead the way over the telephone wires the eye will ultimately follow. Washington and New York are today not only within ear-shot of each other, but within sight as well.

"Scientists for many years, in many countries have struggled to solve the problem of television. We may all take pride in the fact that this actual accomplishment is brought about by American genius and its first demonstration is staged in our own country. I congratulate you, Mr. Gifford, and through you, all of your staff who have contributed to it."

Following the opening conversation the various guests at New York were put into connection for individual communication by telephone and television with the guests at Washington. The short program of entertainment by television and radio telephony from Whippany, N. J., concluded the day's events.

Economic Notes, Second Quarter 1927

THE BUREAU of the Census has released preliminary summaries of some of the statistical results of the biennial census of manufactures for 1925. (Like the census for 1923, the statistics represent operations in a year of substantial prosperity, whereas the three preceding censuses as of 1921, 1919 and 1914, were taken for years, in part or all of which business activity was substantially below normal.) Although the general level of wholesale commodity prices was not as high in 1925 as in 1919, the total value of product, at $62.7 billions, reached a new high record figure. Other new high records were established in the following categories: earnings per wage earner; value added by manufacture, per wage earner; horsepower rating per wage earner; cost of materials used per establishment; and total value of products per establishment. The number of establishments was the lowest for any census year since 1914, and the number of wage earners was lower than in either 1923 or 1919, in spite of the new high record made by the value added by manufacture.

Some interesting relationships follow:

	1925	1923	1921	1919	1914
Wage earners per establishment	44.7	44.8	35.4	42.1	45.8
Earnings per wage earner	$1,280	$1,260	$1,180	$1,160	$500
Value added per wage earner	$3,190	$2,910	$2,640	$2,750	$1,190
Ratio, earnings per wage earner to value added per wage earner	40%	43%	45%	42%	42%
Horsepower per wage earner	4.26	3.77	*	3.26	2.76
Cost of materials per establishment	$191,700	$176,300	$128,600	$173,100	$80,600
Value added per establishment	$334,600	$308,100	$222,000	$289,000	$135,400

* Not available.

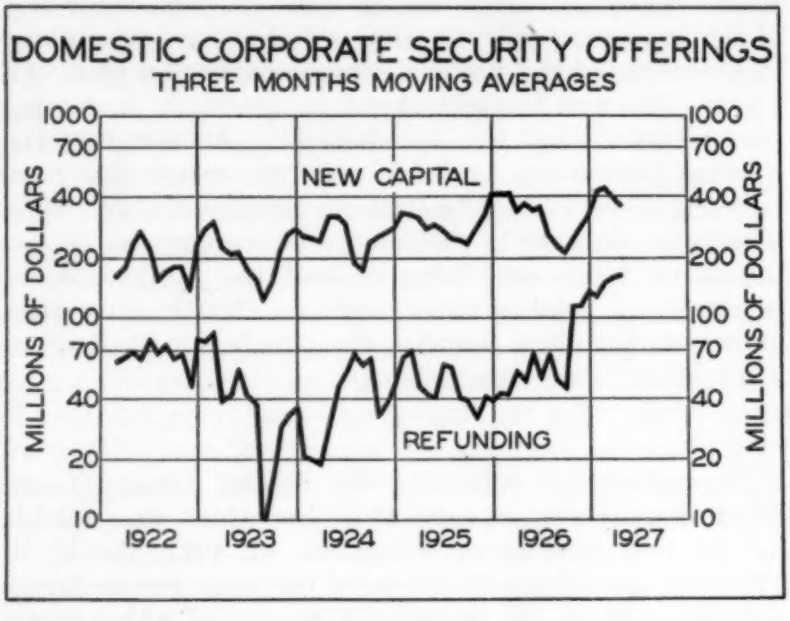
The relative stability in the average number of wage earners employed per establishment, except for the depression year of 1921, is rather striking. The average

earnings of the wage earners have shown an uninterrupted increase, and in 1925 were more than 150% above the figure for 1914. (The serious war crisis of 1914 doubtless led to conditions which made the average wage earnings in that year unduly low.) In spite of this increase, the ratio of the average wages paid to the value added per wage earner was in 1925 the lowest for any of the five years; only 40 cents out of every dollar added to the value of the product represented wages paid. Of course, this was brought about by gradually increasing use of capital, and this is reflected in the fact that the average horsepower available per wage earner rose from only 2¾ in 1914 to 4¼ in 1925, an increase of about 54%. The final two lines in the table showing the cost of materials used per establishment and the total value of products per establishment, indicate clearly, even after allowance for price changes, the steady progression toward larger scale enterprises.

* * *

In calling and refunding the Second Liberty Loan, which did not mature until 1942, but which was callable for the first time as of November 15, 1927, the U. S. Treasury has taken advantage of the same recent favorable situation in the investment market of which many private corporations have been taking advantage. Indeed one of the outstanding phenomena of the last six months has been the unusually high absolute and relative amounts of domestic corporate security issues offered for the purpose of refunding or retiring maturing or called issues. The accompanying chart shows in the form of a centered three months' moving average, monthly figures taken from the Commercial and Financial Chronicle, of domestic corporate security issues for the purpose of raising new capital and for the purpose of refunding. Apart from seasonal fluctuations, there is a pretty steady upward trend to the curve on the chart which represents the raising of new capital. In the case of the lower

curve, however, the movement until about six months ago was virtually horizontal, except for the sharp drop in 1923; but in the last six or seven months a remarkable upward spurt has taken place. Not only have high-coupon bond issues been refunded with bonds bearing lower coupons, but a substantial volume of preferred



stocks with high dividend rates have been refunded with other preferred stocks or with bonds. Doubtless the increased corporate income tax has had some influence in encouraging the retirement of preferred stock issues with the proceeds of bond issues, for by increasing the interest charges, this operation has lessened the amount of net income subject to the corporate income tax. The proportion of earnings available for dividends to common stockholders has thus been increased both by reducing the volume of payments to senior security holders and by lessening the amount payable as taxes.

Incidentally, some recent remarks by Mr. Ogden L. Mills, Under Secretary of the Treasury, are of consider-

able interest as throwing light on the character of the holdings of the Second Libertys. Last March more than $3,000,000,000 Second Liberty bonds were outstanding, when the Secretary of the Treasury announced an issue of 5-year 3½% notes, to be offered in exchange to the holders of the Second Libertys. A total of $1,360,000,000 of bonds were offered in exchange for the notes, and of these, $1,026,000,000 were coupon bonds in $10,000 denominations, 75% of the coupon bonds of this denomination outstanding. On the other hand, less then 3% of the $50 coupon bonds, only 4% of the $100 coupon bonds, less than 8% of the $500 coupon bonds, and about 19% of the $1,000 coupon bonds were exchanged. Mr. Mills commented as follows on these figures:

> "It is not unreasonable to conclude from these figures that the banks, insurance companies and other big holders of Government securities were the ones to whom the March exchange offering appealed and that the individual investor whose holdings of Governments are of moderate amount and who generally favors a long-term bond . . . . either took no particular notice of the Treasury offering or else decided to hold on. . . ."

On May 9th the Secretary of the Treasury called for payment on November 15th all Second Libertys, amounting to about $1,650,000,000, which had not been exchanged for Treasury notes or been retired in other ways. He followed this call with an offering of 20-year 3⅜% bonds to be exchanged at 100 as of June 15th for Second Libertys. According to Mr. Mills, one of the considerations which led the Treasury at this time to offer bonds instead of notes was the "apparent preference" of the small investors for a long-time security. The relatively slow rate at which the Second Libertys are being turned in, however, indicates that the maturity of the new issue has been only one factor, and perhaps a minor one, in determining the exchanges.

Abstracts of Recent Technical Papers from Bell System Sources

Direct Determination of Hydrocarbon in Raw Rubber, Gutta-Percha, and Related Substances,[1] by A. R. Kemp. Iodochloride in glacial acetic acid is shown to be a suitable reagent to determine the unsaturation of the hydrocarbon in rubber or gutta-percha. The influence of time, temperature, sunlight, and reagent concentration upon the reaction is shown.

Comparisons are made between iodochloride, iodobromide and bromine relative to their reactions with raw rubber and some of the terpenes.

Results of analyses of several rubber and gutta-percha samples are given.

The effects of mastication and heat upon the unsaturation of raw rubber are shown.

Microtomic Preparation of Soft Metals for Microscopic Examination,[2] by F. F. Lucas. This paper outlines the apparent limitations of polishing methods for preparing specimens of soft metals for metallographic examination. A microtome method has been developed and its successful application to the study of lead cable sheath alloys illustrated. Much time and labor are saved and results have been obtained which were impossible by polishing methods.

In lead-antimony cable sheath alloys a widened grain boundary phenomenon was disclosed by the new method and the probable nature of the structural changes determined. Changes in structure due to aging are shown and those which accompany thermal or mechanical treatment of the metal may be followed clearly.

Distribution of Energy in Worked Metals,[3] by Lyall Zickrick and R. S. Dean. The purpose of this paper is

[1] Journal of Ind. & Engr. Chem., Vol. 19, 531, 1927.

[2] Institute of Metals Division, A. I. M. E., February 15, 1927.

[3] Wire, Volume 2, page 161, 1927.

to give experimental results that seem to be in accord with the theory, that in the deformation of a crystal, the energy supplied is distributed to the atoms of the lattice, probably by the forced formation of molecules.

Modern Developments in Inspection Methods,[4] by E. D. Hall. This extensively illustrated article describes inspection methods as carried out at the Hawthorne plant of the Western Electric Company. The number of individual piece parts manufactured is more than 100,000 and the number of inspection gauges employed totals more than 25,000. Machine testing and gauging for certain parts is described and cost savings resulting therefrom are given. One of the machines described tests a porcelain protector block containing a carbon insert. The machine is adjusted to accept blocks from which the recess distance of the carbon lies between 0.0024 and 0.0032 inches and to reject, when the distance is 0.0023 inches or less or 0.0033 inches or more. The machine performs its operation at the rate of 2,800 blocks per hour. It is used to test about 4,500,000 blocks per year and represents an annual saving of approximately $2,500.00.

A Direct Comparison of the Loudness of Pure Tones,[5] by B. A. Kingsbury. The loudness of eleven pure tones was studied by adjusting the voltage applied to a telephone receiver to make these tones as loud as certain fixed levels of a 700 cycle tone. The average results of 22 observers, 11 men and 11 women, were arranged as contour lines of equal loudness through the normal auditory sensation area in terms of r.m.s. pressure in ear canal as a function of frequency. Frequencies from 60 to 4,000 cycles were used and intensities from threshold of audibility to 90 T.U. above the 700 cycle threshold. It was found that if the amplitudes of pure tones are increased in equal ratios the loudness of low frequency tones increases much more rapidly than that of high frequency

[4] Mechanical Engineering, Volume 48, page 1435, 1926.

[5] Physical Review, Volume 29, page 588, 1927.

tones. For frequencies above 700 cycles the rate is nearly uniform.

As a loudness unit the least perceptible increment of loudness of a 1,000 cycle tone was employed. In absolute magnitude this varies from level to level, but in the ordinary range of loudness it becomes constant. This unit takes into account the subjective character of loudness.

The variability of the data from which the averages were computed was separated into a factor expressing dissimilarity of ears and another expressing errors of observers' judgment. There was no level at which the variances were a minimum. Dissimilarity of ears causes more variation than errors of observers' judgment. The variances showed no significant sex difference.

The Scattering of Electrons by a Single Crystal of Nickel,[6] by C. Davisson and L. H. Germer. Preliminary announcement is made in this note of the discovery that a beam of swiftly moving electrons in its reaction with a single crystal of nickel behaves in some respects as if it were a beam of wave radiation such as light or X-rays. As the speed of the electron beam is increased a series of critical speeds is found at which sharply defined beams of scattered electrons issue from the crystal. This is similar to what is observed when a beam of monochromatic X-rays is sent into a crystal—as the wavelength of the X-rays is decreased a series of critical wavelengths is found at which sharply defined beams of scattered X-rays issue from the crystal. This X-ray phenomenon is quantitatively accounted for as due to the interference of waves scattered by the regularly arranged atoms of the crystal. In fact, it was this phenomenon discovered by Laue, Friedrick and Knipping in 1913 that established the wave nature of X-radiation, and it is from measurements based on this phenomenon that the lengths of X-ray waves are determined.

The analogous electron phenomenon is less simple,

[6] Nature, 119, 558 (1927).

and yet it is simple enough and of such a nature as to leave little doubt that a beam of swiftly moving electrons is in some sense equivalent to a beam of wave radiation. The wavelength of the equivalent radiation can be measured, and is found to be in satisfactory agreement with requirements of the new theory of wave- or undulatory-mechanics; namely, that the wavelength of the equivalent radiation shall be equal to h/mv, where h represents Planck's universal constant of action, and mv the momentum of an individual electron.

Structure of a Protective Coating of Iron Oxides,[7] by Richard M. Bozorth. It is shown that the Bower-Barff protective coating, produced by the action of steam on iron at about 700° with subsequent cooling in air, is built up of layers of ferrous oxide, magnetite and ferric oxide, arranged in this order (the order of oxidation) upon the iron base. The thickness of these layers are estimated to be of the order of 10^{-2}, 2×10^{-4} and 2×10^{-5} cm., respectively. The data on which the above conclusions are based are the positions and intensities of lines on powder photographs taken with molybdenum, iron and copper K*a* X-rays. The iron and copper K*a* X-rays penetrate the coating to different depths and give information about different parts of its structure because their wave lengths are, respectively, a little greater and a little less than the critical-absorption wave length of the iron which forms the greater part of the coating.

Determination of Electrical Characteristics of Loaded Telegraph Cables,[8] by J. J. Gilbert. Measurements of attenuation, time of propagation and dielectric capacity of the laid cable at various frequencies, supplemented by measurements of eddy current resistance in the factory and by information regarding the manner in which sea return resistance and dielectric leakance vary with frequency, are sufficient for determining the values

[7] J. Amer. Chem. Soc., Vol. 49, pp. 969–976 (1927).

[8] Bell System Technical Journal, July, 1927.

of the four parameters of a loaded cable and for dividing the resistance into its component parts. A general conclusion that can be drawn from the results of measurements made on three cables of somewhat different characteristics is that the method of estimating the characteristics of laid cables from measurements made on short lengths of core during process of manufacture is capable of considerable accuracy.

Measurement of Inductance by the Shielded Owen Bridge,[9] by J. G. Ferguson. The study described in this paper shows that the Owen bridge is well adapted to the accurate measurement of inductance and effective resistance to above 3,000 cycles. The construction of a shielded bridge for audio frequencies is described and a theoretical discussion is also given. It was found possible to measure inductances ranging from 0.1 to 3 henrys with an error of measurement less than 0.1 per cent, and for 10 henrys the accuracy is better than 0.25 per cent. As a means of measuring effective resistance the bridge shows an accuracy of about 2 per cent. The sources of error and method of eliminating or correcting them are discussed.

Automatic Printing Equipment for Long Loaded Submarine Telegraph Cables,[10] by A. A. Clokey. The introduction of the permalloy loaded submarine cable has presented the possiblity of telegraph transmission at speeds several times those obtainable on non-loaded cables. To realize the full advantages afforded by permalloy loading, it became necessary to develop new operating equipment and methods. The present paper presents the various factors which affect the design of operating equipment and describes the apparatus and principles of operation which have been developed and now extensively tried out. The outstanding characteristic of loaded cable is its high speed of transmission which may exceed 2,400 letters per minute. To a certain extent, the detailed design of the terminal apparatus de-

[9], [10] Bell System Technical Journal, July, 1927.

scribed is determined by the electrical characteristics of the particular cable to which it is to be applied and this type of equipment cannot, therefore, be completely standardized.

Application of Vacuum Tube Amplifiers to Submarine Telegraph Cables,[11] by Austen M. Curtis. Vacuum tube amplifiers have been developed for use in submarine telegraph reception and at present are in successful operation on four high speed permalloy cables. There is no limit to the speed at which vacuum tube amplifiers may be operated and in the present stage of development, the rate at which messages may be passed over loaded cables of the length used in the Atlantic Ocean is determined by the cable itself and the mechanical transmitting and receiving apparatus. In regard to maintenance, vacuum tube amplifiers have a great advantage in that they do not require any delicate mechanical adjustments.

[11] Bell System Technical Journal, July, 1927.

Notes on Recent Occurrences

PUBLICITY CONFERENCE

A GENERAL conference of those in charge of Bell System publicity matters was held at Briarcliff Lodge, Briarcliff Manor, New York, April 25 to April 29, 1927. It was attended by the Publicity and Advertising Managers and the Magazine Editors of the American Telephone and Telegraph Company and Associated Bell Companies, the Western Electric Company, the Bell Telephone Laboratories and by the staff of the American Company's Information Department. Vice-President A. W. Page of the American Company presided.

Public Relations activities of all kinds were discussed in detail with special consideration of publicity setting forth the ideals of the industry and the contributions of the parent company to service improvements. The production of educational films was discussed at length, the annual audience reached by Bell System moving pictures having grown in two years from 1,000,000 to over 20,000,000 persons. The advertising of toll and long distance service was another subject to which the conference gave special attention.

Special sessions were conducted by the following conferees:

The Relation Between the Public Relations Department and the Rest of the Business—W. J. O'Connor, Vice-President, Southwestern Bell Telephone Co.

Toll and Long Distance Development—T. T. Cook, Publicity Manager, Long Lines Department, A. T. & T. Co.

Advertising for Local Business—C. E. Rolfe, Assistant to Vice-President, and J. S. Bradley, Advertising Manager, Southern New England Telephone Co.

Institutional and Informative Advertising—P. C. Staples, Vice-President, Bell Telephone Company of Pa.

Publicity—Its Mediums, Objectives, and Methods—A. F. Hardman, Assistant to General Manager, Ohio Bell Telephone Company.

Our Relationship with the A. T. & T. Co.—F. C. Builta, Assistant to President, Northwestern Bell Telephone Company.

What More Can the A. T. & T. Co. Do for Associated Company Publicity Departments—B. C. Carroll, Vice-President, Pacific Telephone & Telegraph Co.

Objectives of the Western Electric Advertising—P. L. Thomson, Publicity Manager, Western Electric Company.

Motion Picture Publicity—H. G. Stokes, Motion Picture Director, A. T. & T. Company.

The General Purpose of a Company Magazine—T. J. Feeney, Assistant to President, New England Telephone & Telegraph Co.

A feature of the conference was an extensive exhibit of publicity and advertising material that had been used in all parts of the System during the past year including an operating model of the first commercial switchboard used in America, and a series of illuminated booths containing shadow pictures in color depicting the history of communications, as prepared by the Southern New England Company for exposition use.

AUDITORS OF RECEIPTS' CONFERENCE

A GENERAL Conference of the Auditors of Receipts of the Associated Operating Companies of the Bell System was held at 195 Broadway, New York City, from May 9 to May 14, 1927, inclusive. The membership of the Conference included representatives of the Commercial Engineer and the Traffic Engineer of the American Telephone and Telegraph Company.

While revenue accounting subjects have had a prominent place on the programs of past Conferences of the General Auditors of the Associated Companies, this Conference of Auditors of Receipts marks the first general meeting of Bell System accounting officials for the discussion of revenue accounting matters exclusively. Its aim was to provide an opportunity for an exchange of views on the important phases of the administration and performance of revenue accounting work. The revenue accounting organizations of the Bell System Companies now comprise over 10,000 people, which fact

emphasizes the importance of efficient administration. The discussions at the Conference brought out clearly the need of the most careful selection and training of employees, particularly for supervisory and managerial positions, and the maintenance of a suitable and adequate Auditors of Receipts' staff organization to care for administrative requirements of the present and the future.

Discussions relating to the performance of the many different classes of revenue accounting work dealt principally with the matter of methods. From these discussions it was evident that great progress had been made during the past few years in the development of improved practices. The detailed operations involved in preparing bills and maintaining the accounts for over 10,000,000 customers of the Bell System are such that the Revenue Accounting Department is faced with the problems of mass production. While these problems are numerous, probably the most important is that of maintaining efficient and economical methods of work procedure, and the discussion of the methods followed by the various companies developed many interesting possibilities for consideration.

Throughout the entire discussion of methods and of matters affecting the company's service to its customers, the quality of the billing service was considered of paramount importance, thus indicating no tendency toward securing economies at the sacrifice of good public relations. The desire to improve billing service from the customer's viewpoint was reflected in an explanation and discussion of a plan of preparing customers' bills by machine. This plan was recently adopted by one of the Associated Companies, and has already demonstrated its advantages over the plan of preparing bills in longhand from the standpoint of economy, accuracy and general appearance of customers' bills. A demonstration of the machine was a very interesting feature of the Conference program.

A general discussion of the Revenue Accounting De-

partment production and measurements plan, developed by the Comptroller's Department of the American Telephone and Telegraph Company for application by the Associated Companies, was another especially interesting feature of the Conference. This discussion indicated the value of the present measurement plan as an aid in the administration of revenue accounting work.

OPERATING CONFERENCE

A CONFERENCE was held at Absecon, New Jersey, from May 11 to 18, of the operating heads, Vice-Presidents and General Managers, of the Associated Companies of the Bell System and their operating areas and staff officials of the American Telephone and Telegraph Company. The results of operation for 1926 were discussed in detail as well as the program for 1927 and subsequent years and the general tendencies. The showing in 1926 was better than in 1925 in practically all respects and the results for 1925 were considered good at the time.

Telephone service has been improving substantially and steadily since the post-war period and the results in 1926 were generally gratifying. The improvement in toll service was particularly marked due to the introduction of new toll board methods and the continued transfer of business from toll boards to direct handling by local operators. Exchange service, which has been on a high plane for several years, shows further improvement. Special attention has been given to the auxiliary services such as information and intercept with good results. Further substantial reductions were made in the time taken to install telephones and the orders delayed by lack of facilities were few. Work in business offices of the companies and in the handling of troubles of one kind or another showed definite improvement.

Not only is the service technically good but the efforts of the last two years to consider service more nearly as the subscriber sees it and to give a more personal and a more pleasing service is showing definite and measureable results. In a service as voluminous as ours and involving such personal contacts with the subscribers, however, there is always opportunity for the expenditure of every effort to effect further improvement and while full recognition was given of the progress already made and of the high standard of telephone service in the United States and Canada, it was the general opinion that further improvement can undoubtedly be made. Particularly in such matters as private branch exchange service, improved completion of exchange calls, improved maintenance in some respects and in many items involving direct and personal contact with the subscribers, there is room for further improvement.

The showing of efficiency of operation is good and as a whole the return on plant investment does not show unfavorable tendencies. The rapid growth of the dial system continues and 16 per cent. of the stations are now operated on that basis.

The work of the Western Electric Company was outlined and there was discussion of the relation of publicity and advertising to operation, of various phases of personnel work and of the development of men for future supervising positions. The very great importance of proper training in all ranks of the organization was brought out clearly.

An innovation at the conference which seemed to work out very well was the preparation of such subjects as organization, personalizing the service and contacts with customers, by special committees of the conferees, In comparison with previous operating conferences, it was interesting to note that with the improvement in all phases of technical work less time was devoted to those subjects and more to matters of general operation.

TREASURERS' CONFERENCE

FROM May 16 to May 21 a conference of the Treasurers of the Bell System was held at Briarcliff Lodge, New York. The Conference was attended by the Treasurers of all companies in the System, by several Vice-Presidents in charge of accounts and finance, and by a number of the Assistant Treasurers and others interested in financial work.

Consideration was given early in the Conference to the monthly cash forecasting problems of Bell System Companies and to various methods of estimating cash requirements and of projecting estimates with accuracy from month to month. Another important topic to be taken up was that of Bell System banking relations, including the selection of banks for various purposes, the development of the greatest benefit from banking contacts, and the regulation of bank balances in proper consideration of services rendered. The Bell System, as a whole, is the largest single customer of the banks of the country, accounts being maintained with over 4,000 banks, which represent more than 25% of the available banks within the territories of the operating companies. An interesting talk was given at this time by the Secretary-Treasurer of the Bell Telephone Company of Canada upon the Canadian banking system; and an address was also given by Dr. W. Randolph Burgess, Assistant Federal Reserve Agent, Federal Reserve Bank of New York, upon federal reserve matters.

On the third day, problems involved in the so-called "economy of money" were discussed, with particular reference to the efficient movement of receipts to meet disbursement requirements and to the methods of conducting field disbursements. Much interest was shown on the one hand in the automatic remittance plan being tried out by the Southwestern Company in part of its territory, under which plan revenue receipts deposited by local commercial offices in country banks are auto-

matically centralized into main banks of deposit; and on the other hand in the system developed by the Northwestern Bell Company for making field disbursements by drawing division voucher checks on three main banks of deposit rather than upon scattered employees' working advance fund accounts.

The following day, some discussion was given to the treasury problems involved in the Direct Sales Plan, particularly in connection with requests for the transfer and delivery of certificates. The opening talk upon this subject was given by Mr. Devereux, of the Bell Telephone Securities Company. This was followed by a review of Bell System stock transfer problems and general relations with Bell System stockholders, who now number about 525,000. Problems involved in handling investment service, particularly to those who have bought stock under the Direct Sales Plan and the preferred stock campaigns, were brought up at this point and the Southwestern Bell Telephone Company, which has been a pioneer with respect to such work, was the leader in the discussion.

Succeeding naturally the preceding talks, an historical survey was presented of the important factors of the development in the stock list of the American Company. This was followed by various discussions upon stock issue problems, both of the American Company and of the Associated Companies, and upon problems involved in the development of Associated Company stockholders' statistics. Measures were also described for remarketing and redistributing Associated Companies' preferred stocks.

A feature of the opening day of the conference was an address by Mr. D. F. Houston, Vice-President of the American Telephone and Telegraph Company in charge of Accounts and Finance; and several interesting talks were given at various times during the conference by members of the Comptroller's Department of the American Company upon subjects related to treasury work.

GENERAL COMMERCIAL CONFERENCE

MANY of the important phases of commercial work were discussed at a General Commercial Conference held at Shawnee-on-Delaware from June 1 to 8. In addition to the general commercial managers, the conference was attended by the commercial managers of most of the large metropolitan areas and a representation from the general staff of the American Telephone and Telegraph Company.

Throughout the conference emphasis was placed upon the importance of rendering a service which is not only technically good but which is of a personal and pleasing nature to customers; and a number of ways in which the commercial departments could effect improvements in the quality of their service along these lines were discussed. The necessity for close inter-departmental cooperation so as to secure prompt and efficient action upon subscribers' requests was stressed and the organization arrangements which would aid in this were thoroughly considered. Special attention was given to the importance of the commercial department having a clear understanding of its functions and responsibilities and its relations to the other departments so that, as the company's business representative, it might not only effectively interpret the company and its policies to subscribers, but also interpret for all departments of the company the subscribers' wishes and requirements as reflected in the business contacts.

The problems involved in selecting and training the commercial department personnel were discussed and there was emphasized the importance of insuring for the future an adequate supply of trained men for the principal supervisory and staff positions. General training methods for commercial employees were also reviewed and there was pointed out the value of results data in indicating the lines along which training efforts might be most effectively employed.

The requirements for reliable estimates of station gain and station movement, in connection with the budgetary plan of the System, were brought out in discussing development estimating. In addition to their importance in planning for the future, the importance of station estimates in current operations was discussed and many ways in which commercial survey data can be of help to the management were developed, of special interest being the use of these data in planning and programming sales activities.

The progress in developing significant data as to the quality and efficiency of business office performance and the use of such information in training work and in improving performance were reviewed. Special attention was given to the means for obtaining and using "service observations" in contacts with customers—counter, telephone and mail—and to plans for better handling of subscribers' criticisms. The value of force adjustment in the business office, as a means of improving the quality of service as well as securing greater efficiency, was emphasized. Much interest was shown in recent developments in the arrangement and equipment of business office, particularly in the new "counterless" type of office, which are planned to make them more attractive and afford better opportunities for personalizing the service.

One of the interesting discussions was that devoted to sales activities. It was brought out that in many situations there are opportunities for improving subscribers' service and the companies' operating results through the application of carefully planned sales effort. Emphasis was placed on the desirability of assisting customers in obtaining service of such type and amount as will best meet their requirements. Illustrations of the results secured from various classes of sales activities were presented and it was pointed out that the effective planning of sales activities requires close cooperation and coordination between the various departments. The op-

portunities for increasing the development and use of auxiliary and by-product services through sales activities were stressed.

Discussion of the subject of telephone directories showed that steady progress is being made in improving their appearance and also increasing their usefulness to customers. Emphasis was placed upon the service features of directories, and the developments in the way of special books, such as street address directories, were reviewed.

MR. BANCROFT GHERARDI ELECTED PRESIDENT OF AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

AT the annual business meeting in New York on May 20 of the American Institute of Electrical Engineers, Mr. Bancroft Gherardi, Vice President and Chief Engineer of the American Telephone and Telegraph Company, was elected president of the society for the next administrative year which begins August 1.

The Institute which Mr. Gherardi will head has a membership of 18,344 electrical engineers and, in addition to three national conventions and a number of regional meetings, holds annually a total of over 1,200 local meetings in the principal cities and educational institutions of the country.

HONORARY DEGREES FOR DR. F. B. JEWETT

THE degree of Doctor of Science was conferred twice during the month of June on Frank B. Jewett, of the American Telephone and Telegraph Company, Vice-President in charge of Development and Research, by Columbia University of New York City on June 1st, and by the University of Wisconsin on June 20th.

JOHN SCOTT MEDAL FOR DR. HERBERT E. IVES

THE John Scott Medal accompanied by a premium of $1,000 has been awarded by the City of Philadelphia to Dr. Herbert E. Ives of the Bell Telephone Laboratories, for his share in the development of a method for transmitting pictures over telephone lines and for the further development of television either over land wires or by radio.

The present award marks the third time in a period of two years that this particular honor has been accorded to a member of the staff of the Bell Telephone Laboratories. The other Laboratories men who have received the John Scott Medal are William G. Housekeeper, for the invention of the copper-glass seal, and Gustaf W. Elman, for the discovery of permalloy.

The fund for the award was established in 1816 by John Scott, a native of Philadelphia, who wished thereby to honor scientists responsible for "useful inventions for the use and benefit of mankind."

Organization Changes

American Telephone and Telegraph Company

Frederic A. Stevenson appointed Assistant Vice-President.

Entered employ of the Bell System as Canvassing Agent in what is now known as the Long Lines Department, May, 1893; District Superintendent at Chicago, 1893; Special Agent, New York, 1901; General Superintendent of Plant, 1908; Director, 1919; Assistant Vice-President, American Telephone and Telegraph Company, June 1, 1927.

H. H. Carter appointed General Commercial Manager, Long Lines Department.

Entered employ of the Bell System with the New England Telephone and Telegraph Company as Night Operator at Belfast, Me., June 1, 1903; transferred to the Plant Department at Portland, Me., a few months later where he worked as an instrument installer and on magneto switchboards; Traffic Department, Boston, on the force of the General Service Inspector, 1905; Chief Operator, Bangor, Me., 1906; District Service Inspector, New Bedford, Mass., 1907; District Traffic Chief, Lowell, Mass., 1907; Commercial Manager, Lynn, Mass., 1910; District Commercial Manager, Bangor, Me., 1917; Division Commercial Superintendent, Eastern Massachusetts division, Boston, 1918; Commercial Superintendent, Metropolitan division, greater Boston, 1920; General Sales Manager for the entire New England Company and then resumed the work of the Metropolitan Division Manager, 1926; General Commercial Manager, Long Lines Department, New York City, May 1, 1927.

New York Telephone Company

J. L. Kilpatrick appointed Vice-President in charge of operations.

Entered employ of the Bell System in the Plant Department of the Bell Telephone Company of Pennsyl-

vania, May 20, 1896. Engineer of Buildings and Equipment, 1908; Division Plant Superintendent, 1915; Assistant Vice-President and General Manager, 1917; General Manager, Installation Department, Western Electric Company, November 1, 1922; Assistant Vice-President, 1924; elected Vice-President and Director, Western Electric Company, in charge of service to telephone companies, January 1, 1925; appointed Operating Vice-President, June 1, 1927.

J. J. Robinson Appointed General Manager, Long Island Division.

Entered employ of the Bell System in New York City, 1899; Supervisor of Plant work in the Long Island Division of the old New York and New Jersey Telephone Company, 1907; Superintendent of Plant for the Bell Telephone Company of Missouri with headquarters in St. Louis, 1912, subsequently became General Plant Superintendent, Michigan State Telephone Company at Detroit, then General Plant Manager for the Southwestern Bell Telephone System. General Plant Manager, New York Telephone Company, March 1, 1924; General Manager, Long Island Division, June 1, 1927.

Robert H. Boggs appointed General Traffic Manager, Long Island Division.

Entered employ of the Bell System as a draftsman with the New York Telephone Company, October 31, 1898; transferred to the Engineering Department, New York and New Jersey Telephone Company as Chief Inspector, March 1, 1901; Traffic Chief for the Long Island Division, New York and New Jersey Telephone Company, 1902; Superintendent of Traffic, 1904; Traffic Chief of the New Jersey Division, New York Telephone Company, 1906; Traffic Chief for the Long Island Division, New York Telephone Company, 1907; Division Superintendent of Traffic, 1908; Traffic Engineer, New York Telephone Company's territory, January 1, 1914; Superin-

tendent of Traffic for Manhattan, Bronx and Westchester, December 1, 1919; General Traffic Manager, Long Island Division, New York Telephone Company, June 1, 1927.

F. T. Woolverton appointed General Plant Manager, Long Island Division.

Entered employ of Bell System as installer's helper, New York Telephone Company, 1897; transferred to central office maintenance force and became Wire Chief of the Madison Square Central Office, 1901; District Inspector, Long Island Division, 1906; Division Equipment Superintendent, July, 1906; Division Plant Superintendent, 1925; Superintendent of Plant, Long Island Division, January 1, 1927; General Plant Manager, June 1, 1927.

K. S. McHugh appointed General Commercial Manager, Long Island Division.

Entered employ of the Bell System in the Commercial Engineer's office, American Telephone and Telegraph Company, 1917, but entered military service upon the advent of the war; reentered Commercial Engineer's office, American Telephone and Telegraph Company, as Engineering Assistant, March 17, 1919; Engineer in charge of Special Rate Problems, 1920; transferred to the Chesapeake & Potomac Telephone Company as General Commercial Engineer, November 1, 1921; General Commercial Manager, Upstate Division, New York Telephone Company, July 15, 1925; General Commercial Manager, Long Island Division, June 1, 1927.

J. H. Gordon, Jr., appointed Chief Engineer, Long Island Division.

Entered employ of the Bell System, Metropolitan Telephone and Telegraph Company, as Assistant in the Engineering Department, 1896; from that position he went to the Traffic Department, June, 1900; Assistant

Traffic Engineer, January 1, 1901; Traffic Engineer, January 1, 1907; General Superintendent of Traffic, January, 1914; Assistant General Traffic Manager, Downstate Division, taking direct charge of Traffic Methods, Employment and Traffic Engineering Departments, November 15, 1920; Chief Engineer, Long Island Division, June 1, 1927.

Victor E. Cooley appointed General Commercial Manager, Upstate Division.

Entered employ of the Bell System as Traffic student, Pacific Telephone and Telegraph Company at San Francisco, August, 1911; held various traffic assignments in San Francisco until 1917, when he entered the Navy, being assigned to communication duties; during the last year of the war, on Admiral Wilson's staff at Brest, in charge of telephone activities ashore for the U. S. Naval forces in France; again became associated with the Pacific Telephone and Telegraph Company as Division Traffic Agent at San Francisco; transferred to the Southwestern Bell Telephone Company at St. Louis as General Toll Traffic Engineer and sent to Dallas as Traffic Superintendent for Texas, 1921; transferred to New York Telephone Company as Division Commercial Manager, Western, with headquarters at Buffalo, April 1, 1926; General Commercial Manager, Upstate Division, June 1, 1927.

A. H. Mellinger appointed General Plant Manager, Downstate Division.

Entered employ of the Bell System in Plant Department, New York Telephone Company, Division Plant Engineer's Office, July, 1905; District Plant Engineer, Bronx Division, 1908; District Plant Engineer, Westchester County, 1909; Acting Division Plant Engineer, Albany, N. Y., 1911; Division Plant Engineer, Long Island Division, 1912; Division Plant Engineer, Manhattan-Bronx-Westchester Division, 1913, Superintendent

of Construction and Engineering, 1920; Division Superintendent of Plant, northern Manhattan, 1923; Division Plant Superintendent, Long Island, January, 1924; Superintendent of Plant, Manhattan, June, 1925; General Plant Manager, Downstate Division, June 1, 1927.

Chesapeake and Potomac Telephone Company

Marshall D. Sedam elected General Manager.

Entered employ of the Bell System with the Central Union Telephone Company at Indianapolis, November, 1903; transferred to the Pacific Telephone and Telegraph as Special Traffic Agent, April, 1907; appointed Division Traffic Superintendent at Los Angeles, August, 1908; Division Traffic Superintendent at San Francisco, October, 1919; General Traffic Manager, Chesapeake and Potomac Telephone Company, February, 1922; General Manager, May 15, 1927.

J. A. Remon appointed General Traffic Manager.

Entered employ of the Bell System in the Long Distance Office, American Telephone and Telegraph Company at Baltimore, 1909; following assignments in Philadelphia and New York, became Division Supervisor of Traffic, New York, June, 1916; transferred to Department of Operation and Engineering, American Telephone and Telegraph Company as Engineer, October, 1920; supervised the work of preparing the first standard toll operating practice used throughout the System; transferred to the Chesapeake and Potomac Company as General Traffic Supervisor, December, 1925; General Traffic Manager, May 15, 1927.